Kinetix 300 EtherNet/IP Indexing Servo Drives

Allen-Bradley

Catalog Numbers 2097-V31PR0, 2097-V31PR2,
2097-V32PR0, 2097-V32PR2, 2097-V32PR4,
2097-V33PR1, 2097-V33PR3, 2097-V33PR5, 2097-V33PR6,
2097-V34PR3, 2097-V34PR5, 2097-V34PR6

User Manual

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Important User Information

Solid state equipment has operational characteristics differing from those of electromechanical equipment. Safety Guidelines for the Application, Installation and Maintenance of Solid State Controls (publication SGI-1.1 available from your local Rockwell Automation sales office or online at http://www.rockwellautomation.com/literature/) describes some important differences between solid state equipment and hard-wired electromechanical devices. Because of this difference, and also because of the wide variety of uses for solid state equipment, all persons responsible for applying this equipment must satisfy themselves that each intended application of this equipment is acceptable.

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Throughout this manual, when necessary, we use notes to make you aware of safety considerations.

WARNING	Identifies information about practices or circumstances that can cause an explosion in a hazardous environment, which may lead to personal injury or death, property damage, or economic loss.
IMPORTANT	Identifies information that is critical for successful application and understanding of the product.
ATTENTION	Identifies information about practices or circumstances that can lead to personal injury or death, property damage, or economic loss. Attentions help you identify a hazard, avoid a hazard, and recognize the consequence
SHOCK HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that dangerous voltage may be present.
BURN HAZARD	Labels may be on or inside the equipment, for example, a drive or motor, to alert people that surfaces may reach dangerous temperatures.

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About This Publication

This manual provides detailed installation instructions for mounting, wiring, and troubleshooting your Kinetix 300 drive, and system integration for your drive/motor combination with a Logix controller.

Who Should Use This Manual

This manual is intended for engineers or technicians directly involved in the installation and wiring of the Kinetix 300 drive and programmers directly involved in operation, field maintenance, and integration of the Kinetix 300 drive.

If you do not have a basic understanding of the Kinetix 300 drive, contact your local Rockwell Automation sales representative for information on available training courses.

Conventions Used in This Manual

The conventions starting below are used throughout this manual.

- Bulleted lists such as this one provide information, not procedural steps
- Numbered lists provide sequential steps or hierarchical information

Additional Resources

These documents contain additional information concerning related Rockwell Automation products.

Resource	Description
Kinetix 300 EtherNet/IP Indexing Servo Drive Installation Instruction, publication 2097-IN001	Information on installing your Kinetix 300 drive system.
Kinetix 300 Shunt Resistor Installation Instructions, publication 2097-IN002	Information on installing and wiring the Kinetix 300 shunt resistors.
Kinetix 300 AC Line Filter Installation Instructions, publication 2097-IN003	Information on installing and wiring the Kinetix 300 AC line filter.
Kinetix 300 I/O Terminal Expansion Block Installation Instructions, publication 2097-IN005	Information on installing and wiring the Kinetix 300 I/O terminal expansion block.
Kinetix 300 Memory Module Installation Instructions, publication 2097-IN007	Information on installing the Kinetix 300 memory module.
Kinetix 300 Memory Module Programmer Quick Start, publication 2097-QS001	Information on using the memory module programmer to duplicate the memory module.
1769-L32E and 1769-L35E CompactLogix Controller Installation Instructions, publication 1769-IN020	Information on how to assemble and mount the controller, how to upgrade firmware, and controller technical specifications.
1769-L32C and 1769-L35CR CompactLogix Controller Installation Instructions, publication 1769-IN070	Information on how to assemble and mount the controller, how to upgrade firmware, and controller technical specifications.
1769-L31 CompactLogix Controller Installation Instructions, publication 1769-IN069	Information on how to assemble and mount the controller, how to upgrade firmware, and controller technical specifications.
Industrial Automation Wiring and Grounding Guidelines, publication 1770-4.1	Provides general guidelines for installing a Rockwell Automation industrial system.
Product Certifications website, www.ab.com	Provides declarations of conformity, certificates, and other certification details.
System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001	Information, examples, and techniques designed to minimize system failures caused by electrical noise.
EMC Noise Management DVD, publication GMC-SP004	
Kinetix Motion Control Selection Guide, publication GMC-SG001	Specifications, motor/servo-drive system combinations, and accessories for Kinetix motion control products.
Motion Analyzer CD, download at www.ab.com/e-tools	Drive and motor sizing with application analysis software.
ControlLogix Controllers User Manual, publication 1756-UM001	Information on installing, configuring, programming, and operating a ControlLogix system.
Logix5000 Controllers Motion Instructions Reference Manual, publication 1756-RM007	The instructions needed to program a motion application.
ControlFLASH Firmware Upgrade Kit User Manual, publication 1756-QS105	For ControlFLASH information not specific to any drive family.
Rockwell Automation Configuration and Selection Tools, website www.ab.com/e-tools	Online product selection and system configuration tools, including AutoCAD (DXF) drawings.
Rockwell Automation Product Certification, website www.rockwellautomation.com/products/certification	For declarations of conformity (DoC) currently available from Rockwell Automation.
National Electrical Code, published by the National Fire Protection Association of Boston, MA	An article on wire sizes and types for grounding electrical equipment.
Rockwell Automation Industrial Automation Glossary, publication AG-7.1	A glossary of industrial automation terms and abbreviations.

You can view or download publications at http://www.rockwellatuomation.com/literature. To order paper copies of technical documentation, contact your local Rockwell Automation distributor or sales representative.

Start

Introduction

Use this chapter to become familiar with the Kinetix 300 drive components. This chapter also reviews design and installation requirements for Kinetix 300 drive systems.

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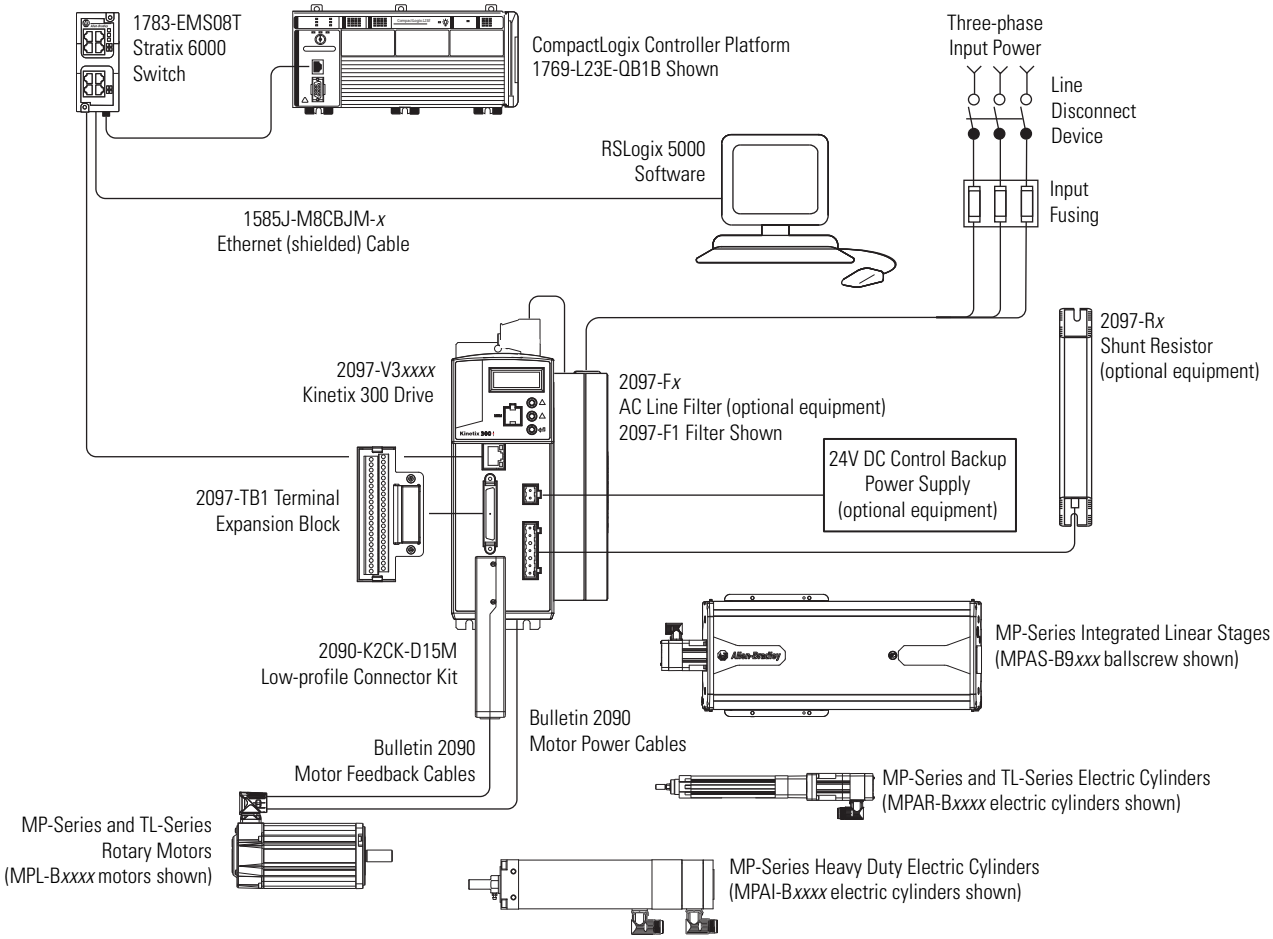
About the Kinetix 300 Drive System

The Kinetix 300 EtherNet/IP indexing servo drive is designed to provide a solution for applications with output power requirements between 0.4…3.0 kW (2…12 A rms).

Kinetix 300 Drive System Overview

Kinetix 300 System Component	Cat. No.	Description
Kinetix 300 EtherNet/IP Indexing Servo Drive	2097-V3*x*PR*x*	Kinetix 300 EtherNet/IP indexing drives with safe torque-off feature are available with 120/240V or 480V AC input power.
AC Line Filters	2097-F*x*	Bulletin 2097-F*x* three-phase AC line filters are required to meet CE and available for use in 230V and 460V systems. They are available in foot mount and side mount models.
Shunt Module	2097-R*x*	Bulletin 2097 shunt module connects to the drive and provides shunting capability in regenerative applications.
Terminal block for I/O connector	2097-TB1	50-pin terminal block. Use with the Kinetix 300 drives (IOD connector) or for control interface connections.
Memory Module Programmer	2097-PGMR	The EPM programmer is use to duplicate the memory and configuration of the Kinetix 300 drives.
Memory Modules 12 Pack	2097-MEM	These removable memory modules are used by the drive to store parameters.
Logix Controller Platform	1769-L23E-*xxx* 1769-L3*x*E-*xxxx* 1768-L4*x* 1756-L6*x* 1766-L32*xxx* 1763-L16*xxx*	EtherNet/IP interface module serves as a link between the ControlLogix/CompactLogix/MicroLogix platform and the Kinetix 300 drive system. The communication link uses EtherNet/IP protocol over a copper cable.
RSLogix 5000 Software	9324-RLD300ENE	RSLogix 5000 software provides support for programming, commissioning, and maintaining the Logix family of controllers.
Rotary Servo Motors	MP-Series, TL-Series	Compatible rotary motors include the MP-Series (Bulletin MPL, MPF, and MPS) 230 and 460V motors; TL-Series motors.
Linear Stages	MP-Series (Ballscrew)	Compatible stages include MP-Series (Bulletin MPAS) 230 and 460V Integrated Linear Stages.
Electric Cylinders	MP-Series, TL-Series	Compatible electric cylinders include MP-Series and TL-Series (Bulletin MPAR and TLAR) 230 and 460V Electric Cylinders.
Cables	Motor/brake and feedback cables	Motor power/brake and feedback cables include SpeedTec and threaded connectors at the motor. Power/brake cables have flying leads on the drive end and straight connectors that connect to servo motors. Feedback cables have flying leads that wire to low-profile connector kits on the drive end and straight connectors on the motor end. Feedback cables are also available with angled (45°) premolded connectors on the drive end and straight connectors that connect to servo motors.
	Communication cables	1585J-M8CBJM-*x* (shielded) Ethernet cable.

Typical Kinetix 300 Drive Installation



Catalog Number Explanation

Kinetix 300 drive catalog numbers and descriptions are listed in the table.

Kinetix 300 Drive Catalog Numbers

Cat. No.	EtherNet/IP Indexing Servo Drive (120/240V)
2097-V31PR0	Kinetix 300,120/240V AC, 1 Ø, 2.0 A
2097-V31PR2	Kinetix 300, 120/240V AC, 1 Ø, 4.0 A
	EtherNet/IP Indexing Servo Drive (240V)
2097-V32PR0	Kinetix 300, 240V AC,1 Ø, 2.0 A, with integrated filter
2097-V32PR2	Kinetix 300, 240V AC, 1 Ø, 4.0 A, with integrated filter
2097-V32PR4	Kinetix 300,240V AC, 1 Ø, 8.0 A, with integrated filter
2097-V33PR1	Kinetix 300, 240V AC, 1 Ø or 3 Ø, 2.0 A
2097-V33PR3	Kinetix 300, 240V AC, 1 Ø or 3 Ø, 4.0 A
2097-V33PR5	Kinetix 300, 240V AC, 1 Ø or 3 Ø, 8.0 A
2097-V33PR6	Kinetix 300, 240V AC, 1 Ø or 3 Ø, 12.0 A
	EtherNet/IP Indexing Servo Drive (480V)
2097-V34PR3	Kinetix 300, 480V AC, 3 Ø, 2.0 A
2097-V34PR5	Kinetix 300, 480V AC, 3 Ø, 4.0 A
2097-V34PR6	Kinetix 300, 480V AC, 3 Ø, 6.0 A

Kinetix 300 Drive Accessories Catalog Numbers

Cat. No.	Drive Components
2097-F*x*	AC Line Filters
2097-TB1	Terminal block for I/O connector
2097-R*x*	Shunt Resistors
2097-PGMR	Memory Module Programmer
2097-MEM	Memory Modules 12 Pack

Agency Compliance

If this product is installed within the European Union and has the CE mark, the following regulations apply.

ATTENTION

Meeting CE requires a grounded system, and the method of grounding the AC line filter and drive must match. Failure to do this renders the filter ineffective and may cause damage to the filter.

For grounding examples, refer to Grounding Your Kinetix 300 Drive on page 61.

For more information on electrical noise reduction, refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

CE Requirements

To meet CE requirements, the following requirements apply.

- Install an AC line filter (catalog number 2097-F*x*) as close to the drive as possible.
- Use 2090 series motor power cables or use connector kits and terminate the cable shields to the subpanel with clamp provided.
- Use 2090 series motor feedback cables or use connector kits and properly terminate the feedback cable shield. Drive-to-motor feedback cables must not exceed 20 m (65.6 ft). Drive-to-motor power cables must not exceed 20 m (65.6.5 ft).
- Install the Kinetix 300 system inside an enclosure. Run input power wiring in conduit (grounded to the enclosure) outside of the enclosure. Separate signal and power cables.
- Segregate input power wiring and motor power cables from control wiring and motor feedback cables. Use shielded cable for power wiring and provide a grounded 360° clamp termination.

Refer to Appendix B on page 123 for interconnect diagrams, including input power wiring and drive/motor interconnect diagrams.

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Installing the Kinetix 300 Drive System

Introduction

This chapter describes system installation guidelines used in preparation for mounting your Kinetix 300 drive components.

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ATTENTION

Plan the installation of your system so that you can perform all cutting, drilling, tapping, and welding with the system removed from the enclosure. Because the system is of the open type construction, be careful to keep any metal debris from falling into it. Metal debris or other foreign matter can become lodged in the circuitry, which can result in damage to components.

System Design Guidelines

Use the information in this section when designing your enclosure and planning to mount your system components on the panel.

For on-line product selection and system configuration tools, including AutoCAD (DXF) drawings of the product, refer to http://www.ab.com/e-tools.

System Mounting Requirements

- To comply with UL and CE requirements, the Kinetix 300 system must be enclosed in a grounded conductive enclosure offering protection as defined in standard EN 60529 (IEC 529) to IP4X such that they are not accessible to an operator or unskilled person. A NEMA 4X enclosure exceeds these requirements providing protection to IP66.
- The panel you install inside the enclosure for mounting your system components must be on a flat, rigid, vertical surface that won't be subjected to shock, vibration, moisture, oil mist, dust, or corrosive vapors.
- Size the drive enclosure so as not to exceed the maximum ambient temperature rating. Consider heat dissipation specifications for all drive components.
- Segregate input power wiring and motor power cables from control wiring and motor feedback cables. Use shielded cable for power wiring and provide a grounded 360º clamp termination.
- Use high-frequency (HF) bonding techniques to connect the enclosure, machine frame, and motor housing, and to provide a low-impedance return path for high-frequency (HF) energy and reduce electrical noise.
- Use 2090 series motor feedback cables or use connector kits and properly terminate the feedback cable shield. Drive-to-motor feedback cables must not exceed 20 m (65.6 ft). Drive-to-motor power cables must not exceed 20 m (65.6.5 ft).

IMPORTANT System performance was tested at these cable length specifications. These limitations are also a CE requirement.

Refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001, to better understand the concept of electrical noise reduction.

Transformer Selection

The Kinetix 300 drive does not require an isolation transformer for three-phase input power. However, a transformer may be required to match the voltage requirements of the controller to the available service.

To size a transformer for the main AC power inputs, refer to Circuit Breaker/Fuse Specifications on page 127 and Transformer Specifications for Input Power on page 128.

IMPORTANT If using an autotransformer, make sure that the phase to neutral/ground voltages do not exceed the input voltage ratings of the drive.

IMPORTANT Use a form factor of 1.5 for single and three-phase power (where form factor is used to compensate for transformer, drive, and motor losses, and to account for utilization in the intermittent operating area of the torque speed curve).

EXAMPLE Sizing a transformer to the voltage requirements of a 2097-V34PR6 Servo Drive.

2097-V34PR6 = 3 kW continuous x 1.5 = 4.5 KVA transformer

Circuit Breaker/Fuse Selection

The Kinetix 300 drives use internal solid-state motor short-circuit protection and, when protected by suitable branch circuit protection, are rated for use on a circuit capable of delivering up to 100,000 A. Fuses or circuit breakers, with adequate withstand and interrupt ratings, as defined in NEC or applicable local codes, are permitted.

The Bulletin 140M and 140U products are another acceptable means of protection. As with fuses and circuit breakers, you must make sure that the selected components are properly coordinated and meet applicable codes including any requirements for branch circuit protection. When applying the 140M/140U product, evaluation of the short circuit available current is critical and must be kept below the short circuit current rating of the 140M/140U product.

In most cases, class CC, J, L, and R fuses selected to match the drive input current rating will meet the NEC requirements or applicable local codes, and provide the full drive capabilities. Dual element, time delay (slow-acting) fuses should be used to avoid nuisance trips during the inrush current of power initialization.

Refer to Circuit Breaker/Fuse Specifications on page 127 for recommended circuit breakers and fuses.

Refer to Kinetix 300 Drive Power Specifications on page 124 for input current and inrush current specifications for your Kinetix 300 drive.

Sizing the Enclosure

With no active method of heat dissipation (such as fans or air conditioning) either of the following approximate equations can be used.

Metric	Standard English
$A = \frac{0.38Q}{1.8T - 1.1}$	$A = \frac{4.08Q}{T - 1.1}$
Where T is temperature difference between inside air and outside ambient (°C), Q is heat generated in enclosure (Watts), and A is enclosure surface area (m^2). The exterior surface of all six sides of an enclosure is calculated as	Where T is temperature difference between inside air and outside ambient (°F), Q is heat generated in enclosure (Watts), and A is enclosure surface area (ft^2). The exterior surface of all six sides of an enclosure is calculated as
A = 2dw + 2dh + 2wh	A = (2dw + 2dh + 2wh) /144
Where d (depth), w (width), and h (height) are in meters.	Where d (depth), w (width), and h (height) are in inches.

If the maximum ambient rating of the Kinetix 300 system is 40 °C (104 °F) and if the maximum environmental temperature is 20 °C (68 °F) then Q=416 and T=20 in the equation below.

$$A = \frac{0.38(416)}{1.8(20) - 1.1} \approx 4.53 m^2$$

In this example, the enclosure must have an exterior surface of 4.53 m^2. If any portion of the enclosure is not able to transfer heat, it should not be included in the calculation.

Since the minimum cabinet depth to house the 230V drive (selected for this example) is 200 mm (7.9 in.), then the cabinet needs to be approximately 2000 mm (high) x 850 mm (wide) x 200 mm (deep).

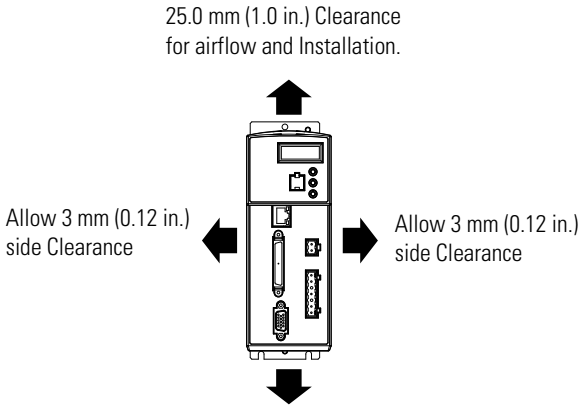
$$2 \times (0.2 \times 0.85) + 2 \times (0.2 \times 2.0) + 2 \times (0.85 \times 2.0) = 4.54m^2$$

Because this cabinet size is considerably larger than what is necessary to house the system components, it may be more efficient to provide a means of cooling in a smaller cabinet. Contact your cabinet manufacturer for options available to cool your cabinet.

Minimum Clearance Requirements

This section provides information to assist you in sizing your cabinet and positioning your Kinetix 300 system components.

Minimum Clearance Requirements


25.0 mm (1.0 in.) Clearance
for airflow and Installation.
Allow 3 mm (0.12 in.)
side Clearance
Allow 3 mm (0.12 in.)
side Clearance
25.0 mm (1.0 in.) Clearance
for airflow and Installation.

Allow additional space for side mount or rear mount AC line filters. See the table and the Kinetix 300 AC Line Filter Installation Instructions, publication 2097-IN003.

Drive	Cabinet Depth, min mm (in.)
2097-V31PR0	332 (13)
2097-V31PR2	
2097-V32PR0	377 (15)
2097-V32PR2	
2097-V32PR4	
2097-V33PR1	332 (13) (1)
2097-V33PR3	
2097-V33PR5	
2097-V33PR6	377 (15)
2097-V34PR3	332 (13) (1)
2097-V34PR5	
2097-V34PR6	377 (15)

(1) If using an AC line filter add 50 mm (2 in.).

IMPORTANT Mount the module in an upright position as shown. Do not mount the module on its side.

IMPORTANT Although clearance left and right is 3 mm (0.12 in.) for ventilation, additional clearance is required when mounted adjacent to noise sensitive equipment or clean wireways.

Refer to page 129 for power dissipation specifications.

Minimizing Electrical Noise

This section outlines best practices which minimize the possibility of noise-related failures as they apply specifically to Kinetix 300 system installations. For more information on the concept of high-frequency (HF) bonding, the ground plane principle, and electrical noise reduction, refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

Bonding Drives

Bonding is the practice of connecting metal chassis, assemblies, frames, shields, and enclosures to reduce the effects of electromagnetic interference (EMI).

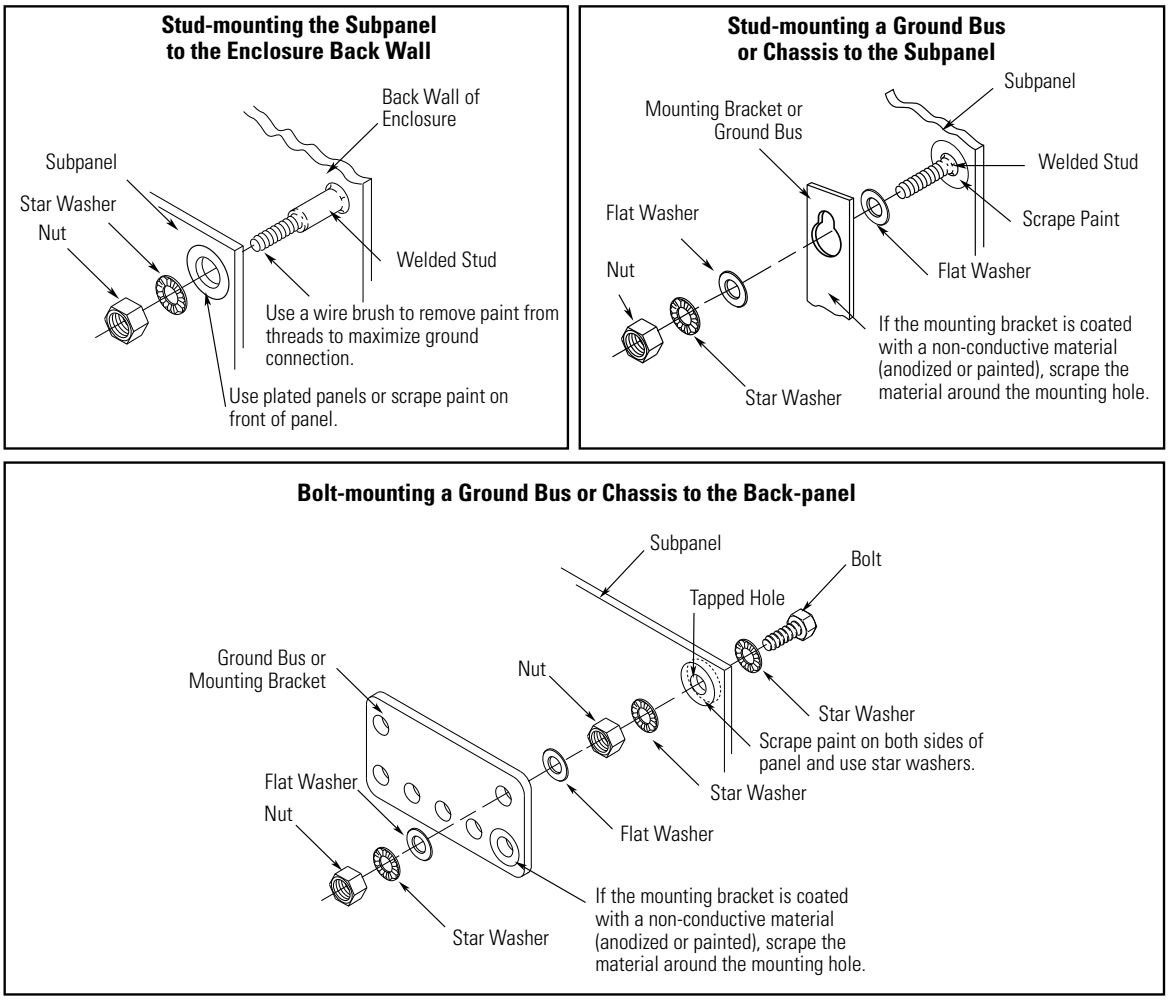
Unless specified, most paints are not conductive and act as insulators. To achieve a good bond between drive and the subpanel, surfaces need to be paint-free or plated. Bonding metal surfaces creates a low-impedance return path for high-frequency energy.

IMPORTANT To improve the bond between the drive and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

Improper bonding of metal surfaces blocks the direct return path and allows high-frequency energy to travel elsewhere in the cabinet. Excessive high-frequency energy can effect the operation of other microprocessor controlled equipment.

The illustrations that follow show details of recommended bonding practices for painted panels, enclosures, and mounting brackets.

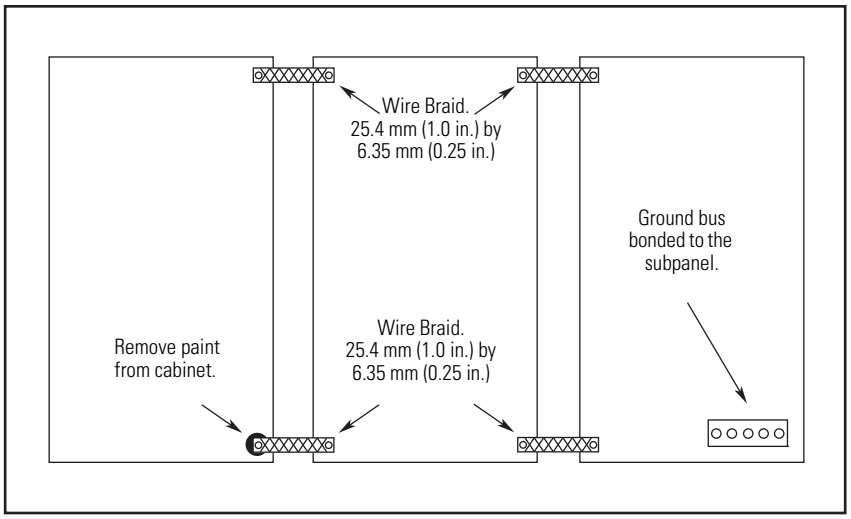
Recommended Bonding Practices for Painted Panels


Stud-mounting the Subpanel to the Enclosure Back Wall
Back Wall of Enclosure
Subpanel
Star Washer
Nut
Welded Stud
Use a wire brush to remove paint from threads to maximize ground connection.
Use plated panels or scrape paint on front of panel.
Stud-mounting a Ground Bus or Chassis to the Subpanel
Subpanel
Mounting Bracket or Ground Bus
Welded Stud
Scrape Paint
Flat Washer
Nut
Flat Washer
If the mounting bracket is coated with a non-conductive material (anodized or painted), scrape the material around the mounting hole.
Star Washer
Bolt-mounting a Ground Bus or Chassis to the Back-panel
Subpanel
Bolt
Tapped Hole
Ground Bus or Mounting Bracket
Nut
Star Washer
Scrape paint on both sides of panel and use star washers.
Star Washer
Flat Washer
Flat Washer
Nut
If the mounting bracket is coated with a non-conductive material (anodized or painted), scrape the material around the mounting hole.
Star Washer

Bonding Multiple Subpanels

Bonding multiple subpanels creates a common low impedance exit path for the high frequency energy inside the cabinet. Subpanels that are not bonded together may not share a common low impedance path. This difference in impedance may affect networks and other devices that span multiple panels.

Multiple Subpanels and Cabinet Recommendations

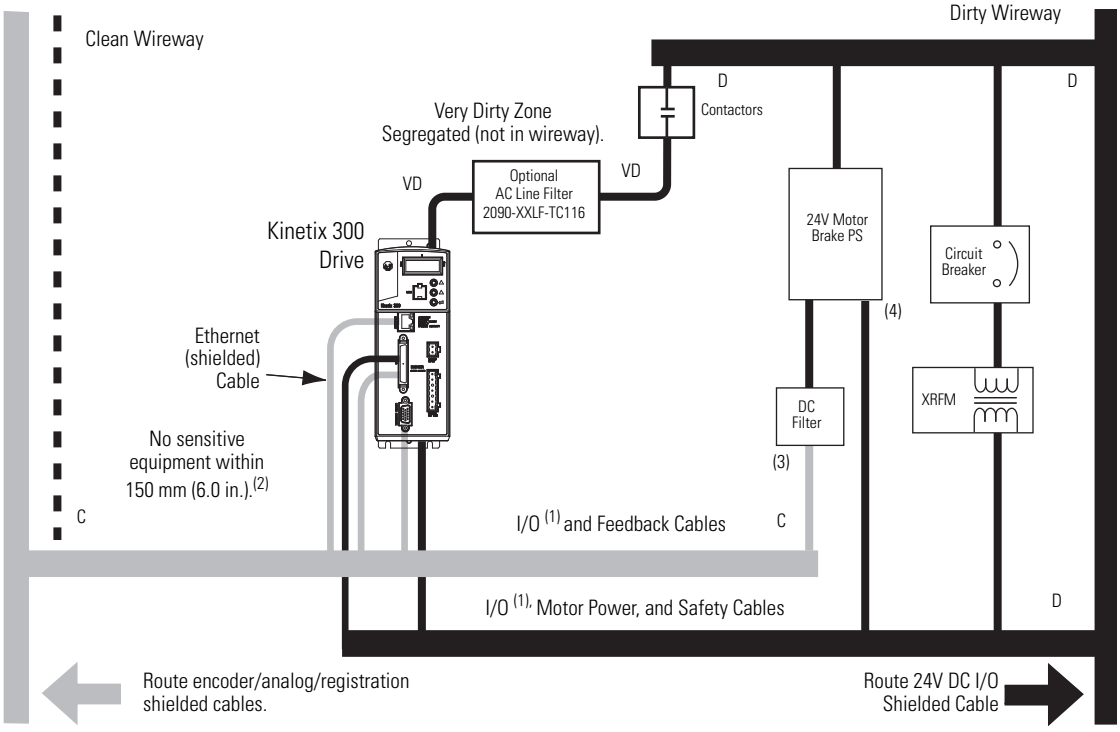


Establishing Noise Zones

Observe these guidelines when individual input power components are used in the Kinetix 300 system:

- The clean zone (C) exits left of the Kinetix 300 system and includes the I/O wiring, feedback cable, Ethernet cable, and DC filter (grey wireway).
- The dirty zone (D) exits right of the Kinetix 300 system (black wireway) and includes the circuit breakers, transformer, 24V DC power supply, contactors, AC line filter, motor power, and safety cables.
- The very dirty zone (VD) is limited to where the AC line (EMC) filter VAC output jumpers over to the drive. Shielded cable is required only if the very dirty cables enter a wireway.

Establishing Noise Zones for Installations With Bulletin 2090 AC Line Filter



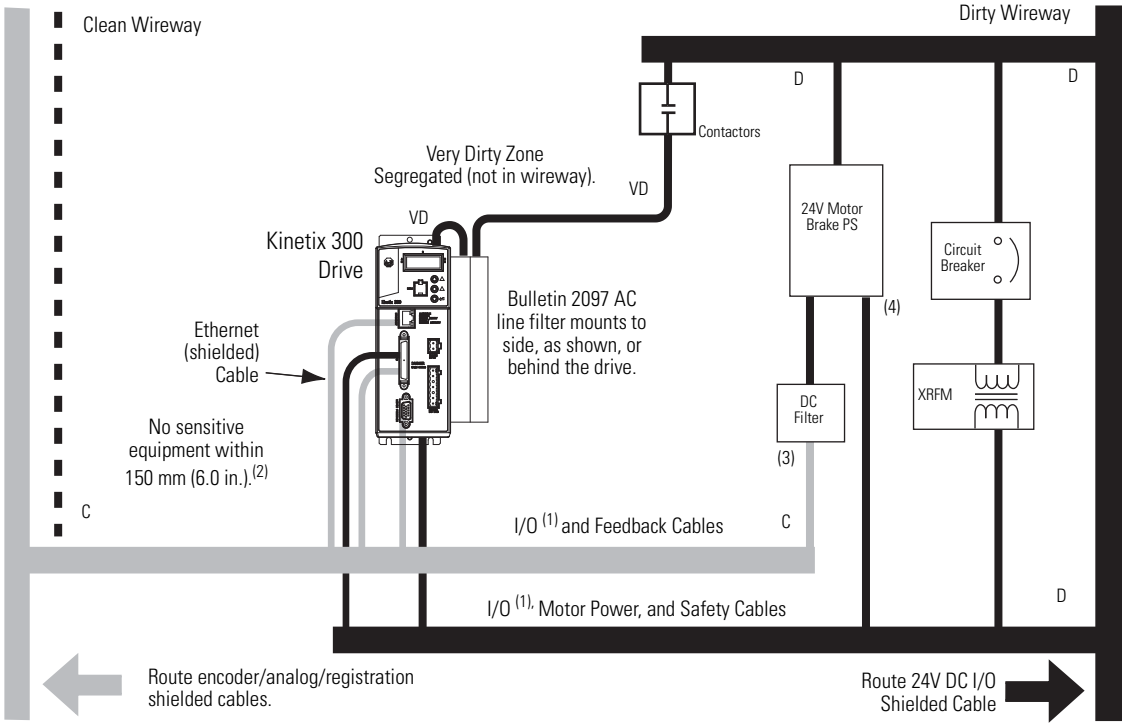
(1) If drive system I/O cable contains (dirty) relay wires, route cable in dirty wireway.

(2) For tight spaces use a grounded steel shield. For examples, refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

(3) This is a clean 24V DC available for any device that may require it. The 24V enters the clean wireway and exits to the left.

(4) This is a dirty 24V DC available for motor brakes and contactors. The 24V enters the dirty wireway and exits to the right.

Establishing Noise Zones for Installations With Bulletin 2097 AC Line Filter



(1) If drive system I/O cable contains (dirty) relay wires, route cable in dirty wireway.

(2) For tight spaces use a grounded steel shield. For examples, refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

(3) This is a clean 24V DC available for any device that may require it. The 24V enters the clean wireway and exits to the left.

(4) This is a dirty 24V DC available for motor brakes and contactors. The 24V enters the dirty wireway and exits to the right.

Cable Categories for Kinetix 300 Drive Components

These table indicate the zoning requirements of cables connecting to the Kinetix 300 drive components.

Kinetix 300 Drive Components

Wire/Cable	Connector	Zone			Method	
		Very Dirty	Dirty	Clean	Ferrite Sleeve	Shielded Cable
L1, L2, L3 (unshielded cable)	IPD	X				
U, V, W (motor power)	MP		X			X
B+-, B-, BR (shunt resistor)	BC		X			
24V DC	BP			X		
Control COM, 24V DC control, safety enable, and feedback signals for safe-off feature	STO		X			
Motor feedback	MF			X		X
Registration and analog outputs	IOD			X		X
Others			X			
Ethernet	Port 1			X		X

Noise Reduction Guidelines for Drive Accessories

Refer to this section when mounting an AC line filter or shunt resistor module for guidelines designed to reduce system failures caused by excessive electrical noise.

AC Line Filters

Observe the following guidelines when mounting your AC line filter:

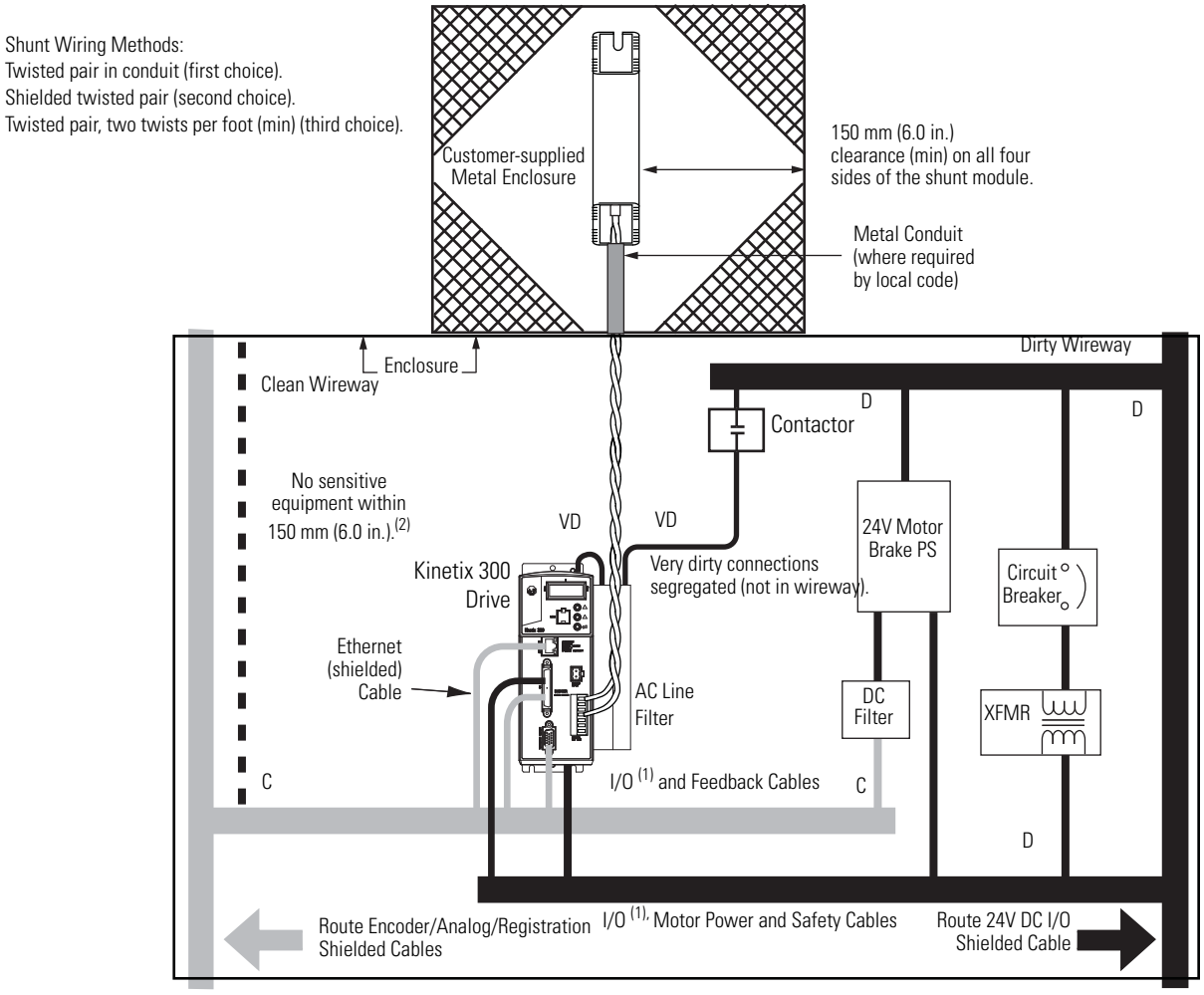
- Good HF bonding to the panel is critical. For painted panels, refer to the examples on page 23.
- Segregate input and output wiring as far as possible.

Shunt Resistors

Observe these guidelines when mounting your shunt resistor outside the enclosure:

- Mount shunt resistor and wiring in the very dirty zone or in an external shielded enclosure.
- Mount resistors in a shielded and ventilated enclosure outside the cabinet.
- Keep unshielded wiring as short as possible. Keep shunt wiring as flat to the cabinet as possible.

Shunt Resistor Outside the Enclosure



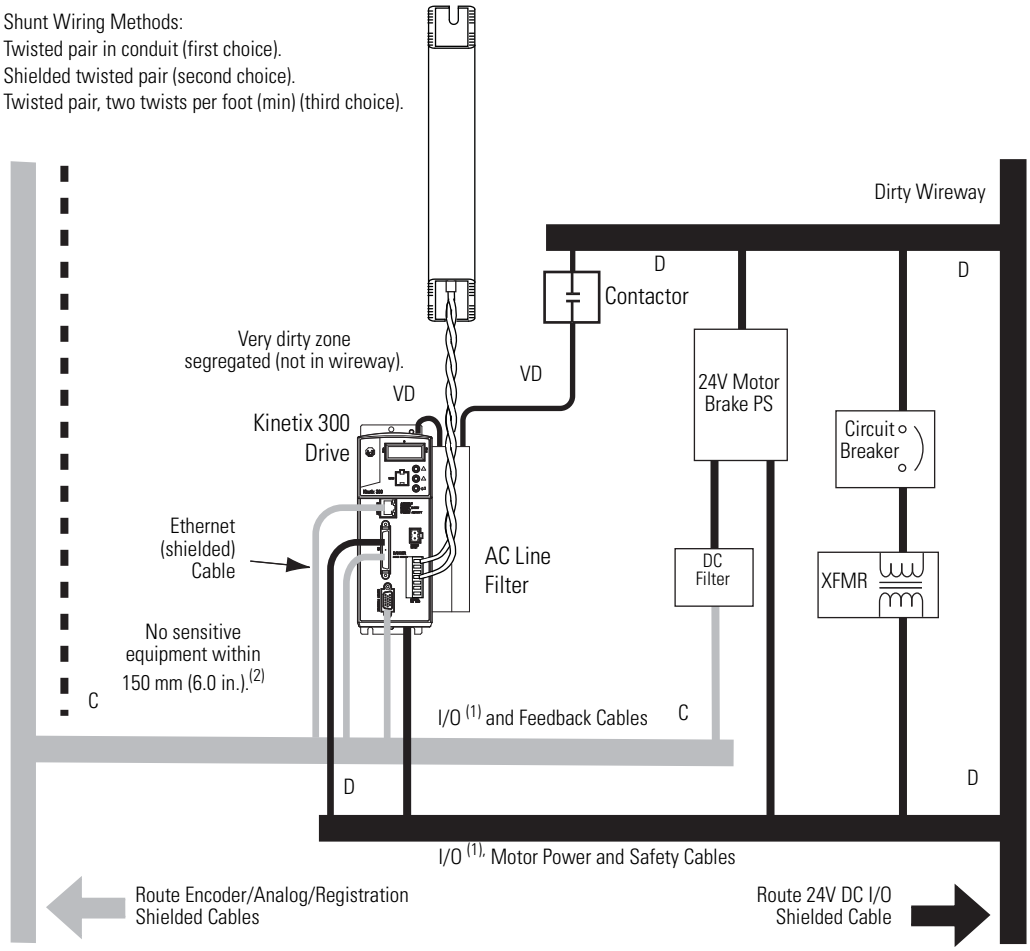
(1) If drive system I/O cable contains (dirty) relay wires, route cable in dirty wire way.

(2) When space does not permit the 150 mm (6.0 in.) segregation, use a grounded steel shield instead. for examples, refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

When mounting your shunt module inside the enclosure, follow these additional guidelines:

- Mount the shunt resistor anywhere in the dirty zone, but as close to the Kinetix 300 drive as possible.
- Shunt wires can be run with motor power cables.
- Keep unshielded wiring as short as possible. Keep shunt wiring as flat to the cabinet as possible.
- Separate shunt wires from other sensitive, low voltage signal cables.

Shunt Resistor Inside the Enclosure



(1) If drive system I/O cable contains (dirty) relay wires, route cable in dirty wire way.

(2) When space does not permit the 150 mm (6.0 in.) segregation, use a grounded steel shield instead. for examples, refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

Motor Brake

The brake is mounted inside the motor, how you connect to the axis module depends on the motor series.

Refer to Kinetix 300 Drive/Rotary Motor Wiring Examples beginning on page 141 for the interconnect diagram of your drive/motor combination.

Mounting Your Kinetix 300 Drive

The procedures in this section assume you have prepared your panel and understand how to bond your system. For installation instructions regarding other equipment and accessories, refer to the instructions that came with each of the accessories for their specific requirements.

ATTENTION

This drive contains electrostatic discharge (ESD) sensitive parts and assemblies. You are required to follow static control precautions when you install, test, service, or repair this assembly. If you do not follow ESD control procedures, components can be damaged. If you are not familiar with static control procedures, refer to Allen-Bradley publication 8000-4.5.2, Guarding Against Electrostatic Damage or any other applicable ESD Protection Handbook.

Follow these steps to mount your Kinetix 300 drive.

1. Layout the position for the Kinetix 300 and accessories in the enclosure (refer to Establishing Noise Zones for panel layout recommendations).

   Mounting hole dimensions for the Kinetix 300 are shown in Appendix A.

2. Attach the Kinetix 300 drive to the cabinet, first using the upper mounting slots of the drive and then the lower.

   The recommended mounting hardware is M4 (#6-32) steel machine screw torqued to 1.1 N•m (9.8 lb•in). Observe bonding techniques as described in Bonding Drives.

IMPORTANT

To improve the bond between the Kinetix 300 drive and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

3. Tighten all mounting fasteners.

Kinetix 300 Drive Connector Data

Introduction

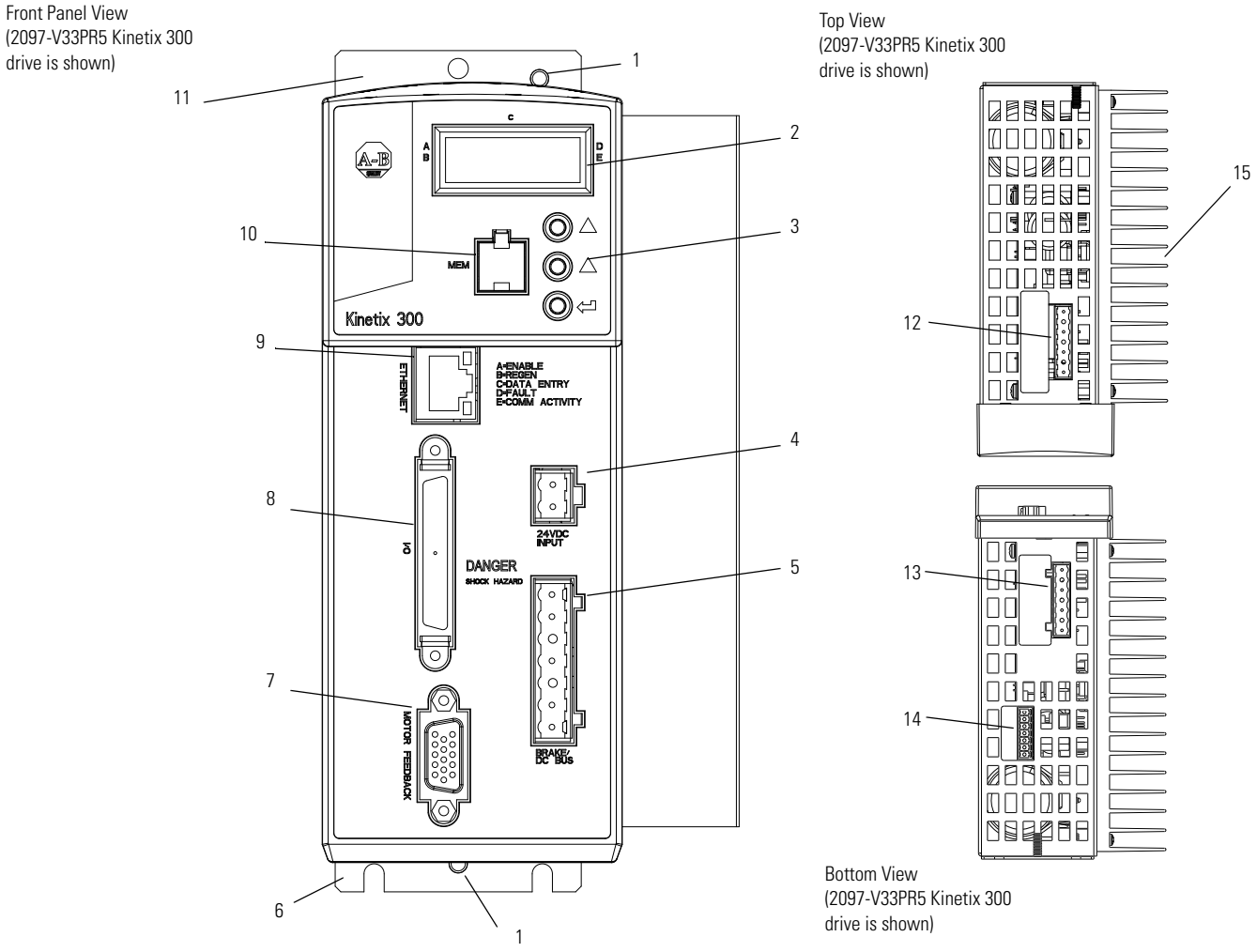
This chapter provides power, feedback, and I/O connector locations and signal descriptions for your Kinetix 300 drive.

Topic	Page
Introduction	31
Kinetix 300 Drive Connectors and Indicators	32
Understanding Motor Feedback Specifications	38
Understanding Control Signal Specifications	44

Kinetix 300 Drive Connectors and Indicators

Although the physical size of the 460V modules is larger than the 230V modules, the location of the connectors and indicators is identical.

Kinetix 300 Drive Connector and Indicators



Item	Description
1	Ground lug
2	Status and diagnostic display
3	Display control push buttons (3)
4	Back-up power (BP) connector
5	Shunt resistor and DC bus (BC) connector
6	Bottom mounting flange
7	Motor feedback (MF) connector
8	I/O (IOD) connector

Item	Description
9	Ethernet communication port (Port 1)
10	Memory module
11	Top mounting flange
12	Mains (IPD) connector
13	Motor power (MP) connector
14	Safe torque off (STO) connector
15	Heat sink (on some models)

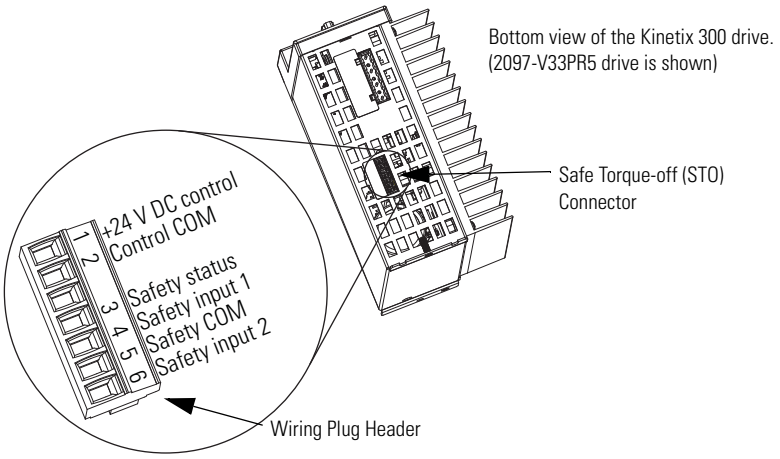
Kinetix 300 Drive Connectors

Designator	Description	Connector
IPD	AC input power	4-position plug/header
PORT1	Ethernet communication port	RJ45 Ethernet
IOD	I/O	SCSI 50 pin high density connector.
MF	Motor feedback	15-pin high-density D-shell (male)
CPD	Back-up power	2-pin quick-connect terminal block
BC	Brake Resistor and DC Bus	5-pin quick-connect terminal block
MP	Motor power	6-pin quick-connect terminal block
STO	Safe torque off (STO) Terminal	6-pin quick-connect terminal block

Safe Torque-off Pinout

The Kinetix 300 drive ships with the (6-pin) wiring-plug header that connects to your safety circuit to the Kinetix 300 drive safe torque-off (STO) connector. If your system does not use the safe torque-off feature, follow instructions in Appendix D starting on page 155 to wire the drive with motion allow jumpers.

Safe Torque-off Connector



Kinetix 300 Drive Safe Torque-off (STO) Connector

STO Pin	Description	Signal
1	+24V DC output from the drive	+24V DC control
2	+24V DC output common	Control COM
3	Safety status	Safety Status
4	Safety input 1 (+24V DC to enable)	Safety Input 1
5	Safety common	Safety COM
6	Safety input 2 (+24V DC to enable)	Safety Input 2

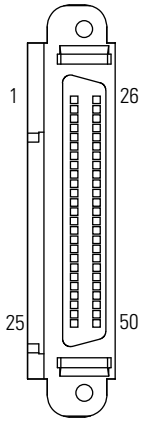
IMPORTANT Pins STO-1 (+24V DC Control) and STO-2 (Control COM) are used only by the motion-allowed jumpers to defeat the safe torque-off function. When the safe torque off function is in operation, the 24V supply must come from an external source.

I/O (IOD) Connector Pinout

IOD Pin	Description	Signal
1	Master encoder A+/Step+ input	MA+
2	Master encoder A-/Step- input	MA-
3	Master encoder B+/Direction+ input	MB+
4	Master encoder B-/Direction- input	MB-
5	Drive logic common	GND
6	+5V DC Output (max 100 mA)	5V DC
7	Buffered encoder output: channel A+	BA+
8	Buffered encoder output: channel A-	BA-
9	Buffered encoder output: channel B+	BB+
10	Buffered encoder output: channel B-	BB-
11	Buffered encoder output: channel Z+	BZ+
12	Buffered encoder output: channel Z-	BZ-
13…21	Reserved	—
22	Analog common	ACOM
23	Analog output (max 10 mA)	AO
24	Positive (+) of analog signal input	AIN1+
25	Negative (-) of analog signal input	AIN1-
26	Digital input group ACOM terminal	IN_A_COM
27	Digital input A1	IN_A1
28	Digital input A2	IN_A2
29	Digital input A3	IN_A3

IOD Pin	Description	Signal
30	Digital input A4	IN_A4
31	Digital input group BCOM terminal	IN_B_COM
32	Digital input B1	IN_B1
33	Digital input B2	IN_B2
34	Digital input B3	IN_B3
35	Digital input B4	IN_B4
36	Digital input Group CCOM Terminal	IN_C_COM
37	Digital input C1	IN_C1
38	Digital input C2	IN_C2
39	Digital input C3	IN_C3
40	Digital input C4	IN_C4
41	Ready output collector	RDY+
42	Ready output emitter	RDY-
43	Programmable output #1 collector	OUT1-C
44	Programmable output #1 emitter	OUT1-E
45	Programmable output #2 collector	OUT2-C
46	Programmable output #2 emitter	OUT2-E
47	Programmable output #3 collector	OUT3-C
48	Programmable output #3 emitter	OUT3-E
49	Programmable output #4 collector	OUT4-C
50	Programmable output #4 emitter	OUT4-E

Pin Orientation for 50-pin SCSI I/O (IOD) Connector



Motor Feedback (MF) Connector Pinout

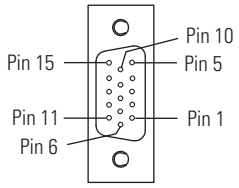
MF Pin	Description	Signal
1	Sine differential input+ AM+ differential input+	SIN+ AM+
2	Sine differential input- AM- differential input-	SIN- AM-
3	Cosine differential input+ BM+ differential input+	COS+ BM+
4	Cosine differential input- BM- differential input-	COS- BM-
5	Data differential input + Index pulse+	DATA+ IM+
6	Common	ECOM
7	Encoder power (+9V)	EPWR_9V (2)
8	Single-ended 5V Hall effect commutation	S3

MF Pin	Description	Signal
9	Reserved	—
10	Data differential input - Index pulse-	DATA- IM-
11	Motor thermal switch (normally closed) (1)	TS
12	Single-ended 5V Hall effect commutation	S1
13	Single-ended 5V Hall effect commutation	S2
14	Encoder power (+5V)	EPWR_5V (2)
15	Reserved	—

(1) Not applicable unless motor has integrated thermal protection.

(2) Encoder power supply uses either 5V or 9V DC based on encoder/motor used.

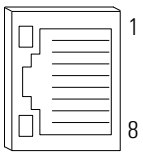
Pin Orientation for 15-pin Motor Feedback (MF) Connector



Ethernet Communication Port (port 1)

Port 1 Pin	Signal	Description
1	+ TX	Transmit Port (+) Data Terminal
2	- TX	Transmit Port (-) Data Terminal
3	+ RX	Receive Port (+) Data Terminal
4	—	—
5	—	—
6	- RX	Receive Port (-) Data Terminal
7	—	—
8	—	—

Pin Orientation for 8-pin Ethernet Communication Port (port 1)



AC Input Power (IPD) Connector

IPD Pin	Description	Signal
1	Protective Earth (ground)	PE
2	AC Power In	L1
3	AC Power In	L2
4	AC Power In (3 phase models)	L3

Back-up Power Pinout

Back-up Power (BP) Connector

BP Pin	Description	Signal
1	Positive 24V DC	+24V DC
2	24V DC power supply return	Return

Shunt Resistor and DC Bus Pinout

Shunt Resistor and DC Bus (BC) Connector

BC Pin	Description	Signal
1…2	Positive DC bus/brake resistor	B+
3	Brake Resistor	BR
4…5	Negative DC bus	B-

Motor Power Pinout

Motor Power (MP) Connector

MP Pin	Description	Signal
1…2	Reserved	—
3	Motor power out	U
4	Motor power out	V
5	Motor power out	W
6	Protective Earth (ground)	PE

Understanding Motor Feedback Specifications

The Kinetix 300 drive accepts motor feedback signals from the following types of encoders with these general specifications.

Motor Feedback General Specifications

Attribute	Motor Feedback
Feedback device support	• Stegmann Hiperface • Generic TTL Incremental • Tamagawa 17-bit Serial
Power supply voltage (EPWR5V)	5.13…5.67V
Power supply current (EPWR5V)	400 mA, max (1) (2)
Power supply voltage (EPWR9V)	8.3…9.9V
Power supply current (EPWR9V)	275 mA, max (2)(3)
Thermostat	Single-ended, under 500 Ω = no fault, over 10 kΩ = fault

(1) 400 mA on the 5V supply with no load on the 9V supply.
(2) 300 mA on the 5V supply with 150 mA on the 9V supply.
(3) 275 mA on the 9V supply with no load on the 5V supply.

TIP Auto-configuration is possible using the Kinetix 300 drive MotionView OnBoard software for Allen-Bradley motors.

Motor Feedback Specifications

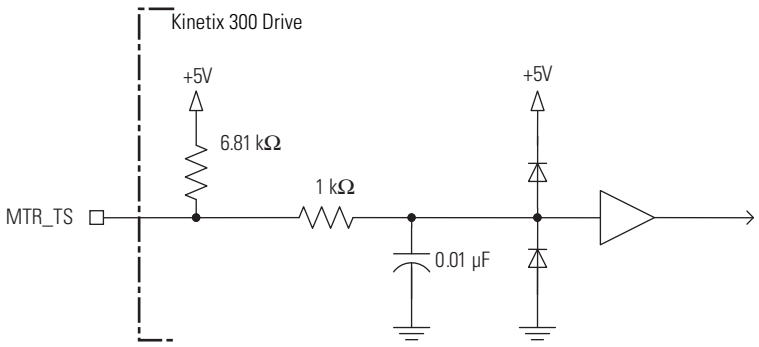
The Kinetix 300 drives support multiple types of feedback devices using the 15-pin (MF) motor feedback connector and sharing connector pins in many cases.

Motor Feedback Signals by Device Type

MF Pin	Stegmann Hiperface	Generic TTL Incremental	Tamagawa 17-bit Serial
1	SIN+	AM+	—
2	SIN-	AM-	—
3	COS+	BM+	—
4	COS-	BM-	—
5	DATA+	IM+	DATA+
6	ECOM	ECOM	ECOM
7	EPWR9V	—	—
8	—	S3	—
9	—	—	—
10	DATA-	IM-	DATA-
11	TS	TS	—
12	—	S1	—
13	—	S2	—
14	—	EPWR5V	EPWR5V
15	—	—	—

This is the motor thermostat interface schematic. Although the thermostat signal is shown for all feedback types, some motors may not support this feature since it is not part of the feedback device.

Motor Thermostat Interface



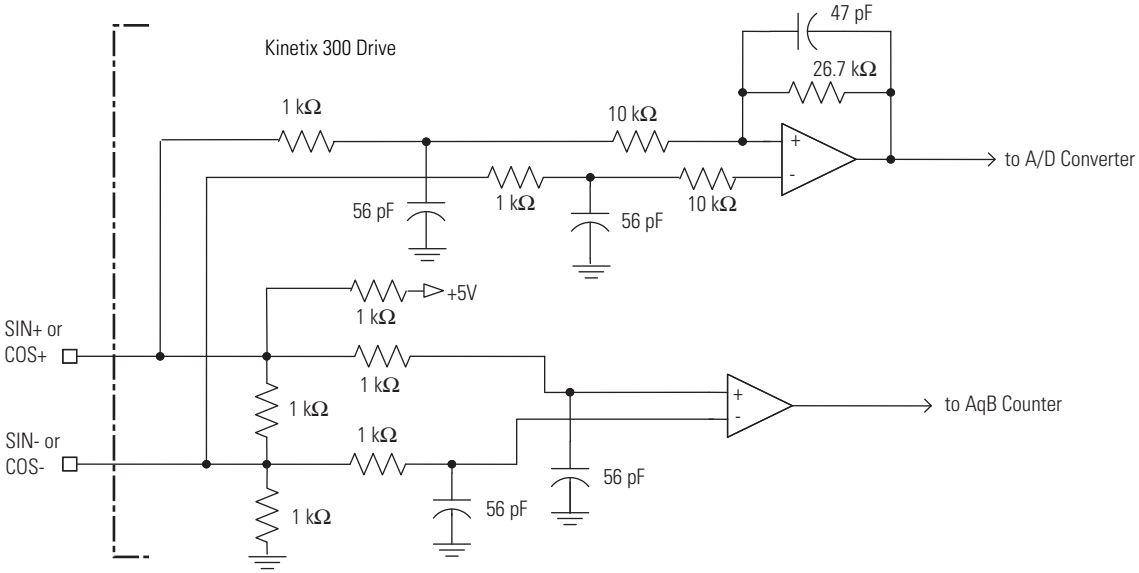
Motor Thermostat State

State	Resistance at TS
No Fault	500 Ω
Fault	10 kΩ

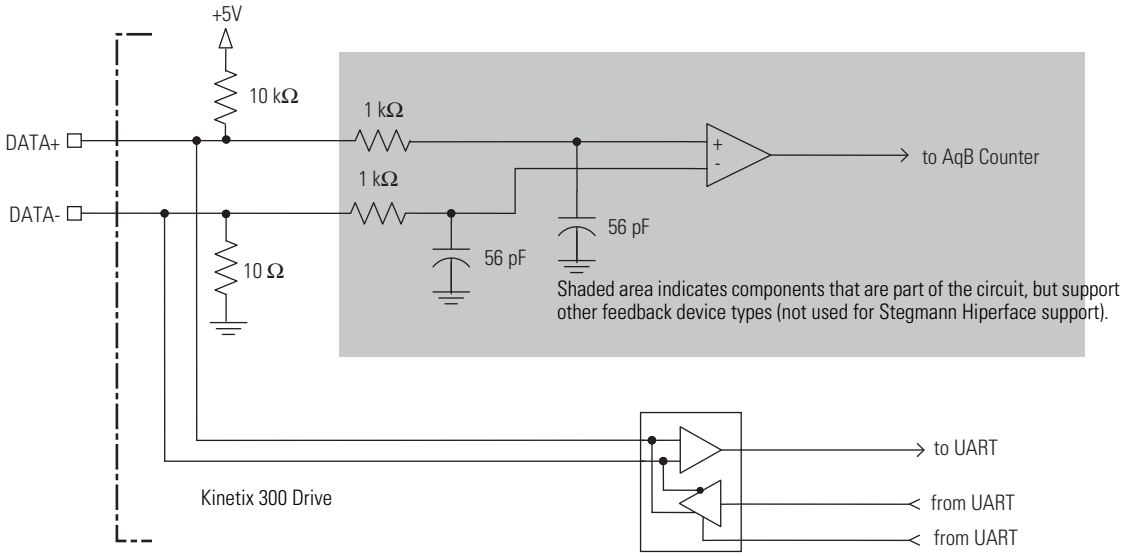
Stegmann Hiperface Specifications

Attribute	Value
Protocol	Hiperface
Memory support	Not programmed, or programmed with Allen-Bradley motor data
Hiperface data communication	RS485, 9600 baud, 8 data bits, no parity
Sine/Cosine interpolation	2048 counts/sine period
Input frequency (AM/BM)	250 kHz, max
Input voltage (AM/BM)	0.6...1.2V, p-p, measured at the drive inputs
Line loss detection (AM/BM)	Average ($sin^2 + cos^2$) > constant

Stegmann Hiperface Interface, SIN and COS Signals



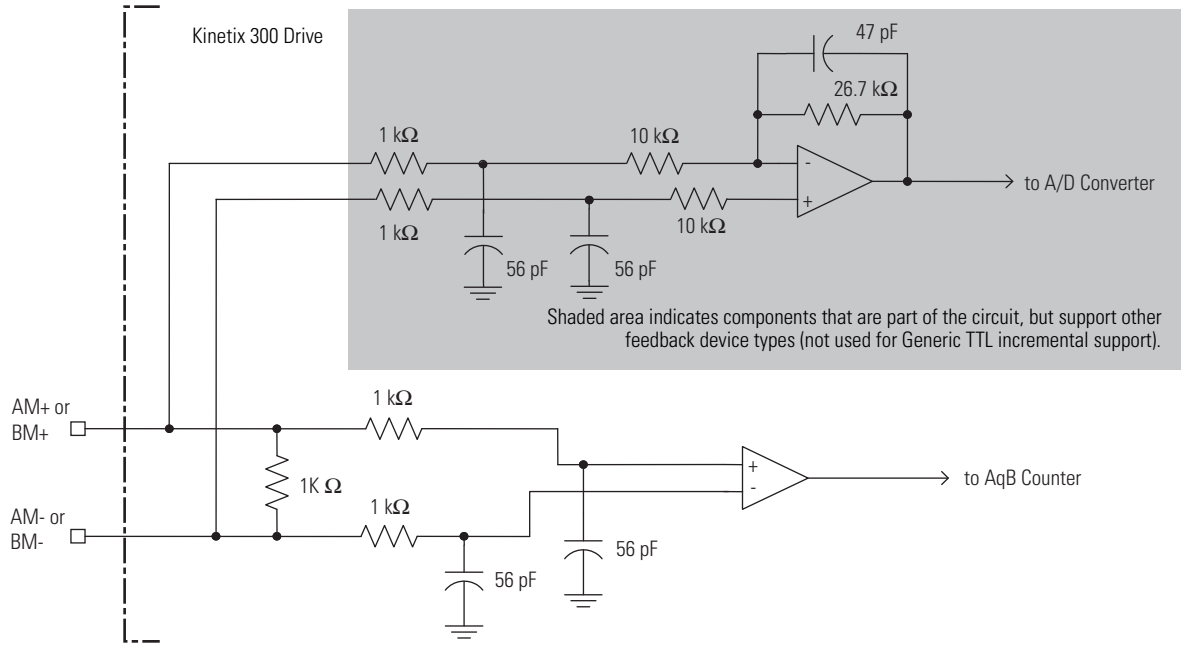
Stegmann Hiperface Interface, DATA Signals



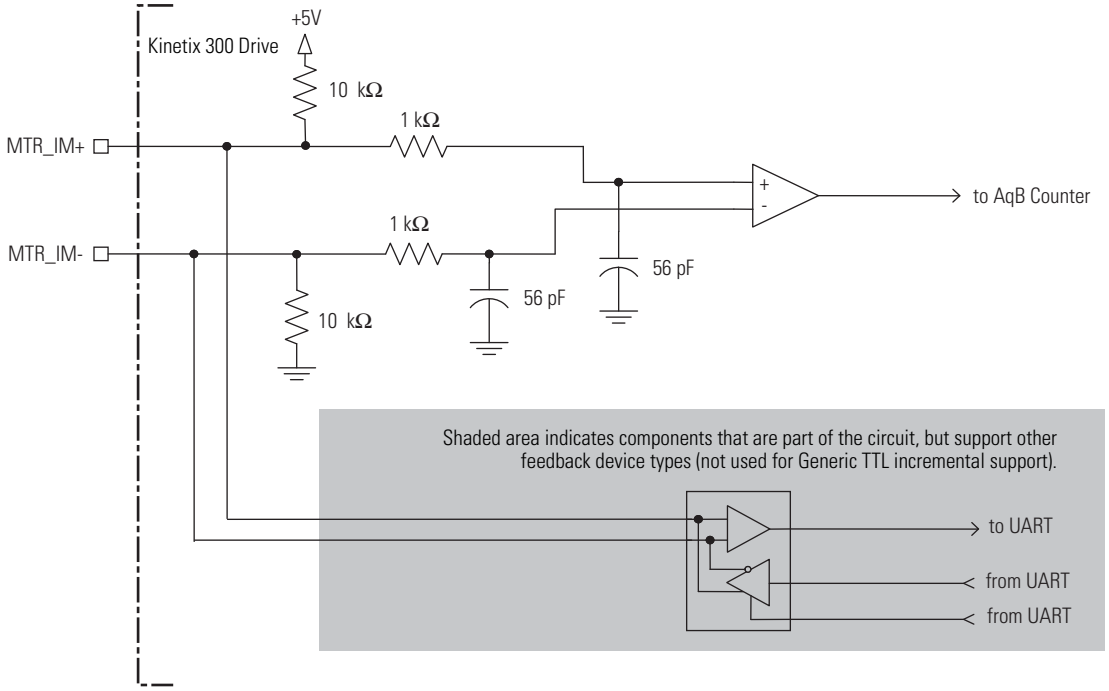
Generic TTL Incremental Specifications

Attribute	Value
TTL incremental encoder support	5V, differential A quad B
Quadrature interpolation	4 counts/square wave period
Differential input voltage (AM, BM, and IM)	1.0…7.0V
DC current draw (AM, BM, and IM)	30 mA, max
Input signal frequency (AM, BM, and IM)	5.0 MHz, max
Edge separation (AM and BM)	42 ns min, between any two edges
Line loss detection (AM and BM)	Average ($AM^2 + BM^2$) > constant
Hall inputs (S1, S2, and S3)	Single-ended, TTL, open collector, or none

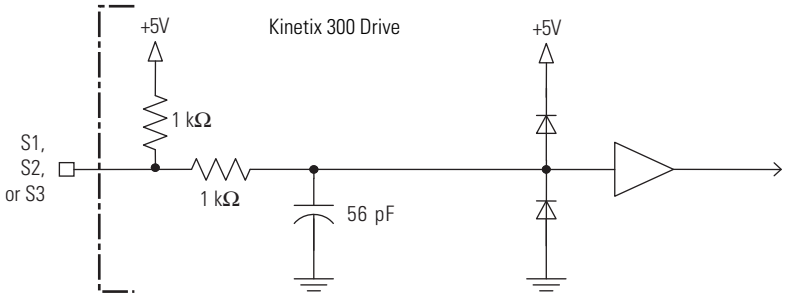
Generic TTL Incremental, AM and BM Signals



Generic TTL Interface, IM Signals



Generic TTL Interface, S1, S2, or S3 Signals



Tamagawa 17-bit Serial Specifications

Attribute	Value
Tamagawa model support	TS5669N124
Protocol	Tamagawa proprietary
Memory support	Programmed with Allen-Bradley motor data
Differential input voltage	1.0…7.0V
Data communication	2.5 Mbps, 8 data bits, no parity
Battery	3.6V, located external to drive in low-profile connector kit

Refer to page 40 for the Tamagawa 17-bit serial interface schematic. It is identical to the Stegmann Hiperface (DATA) signals schematic.

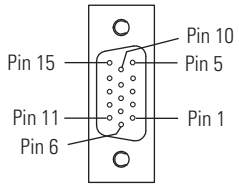
Feedback Power Supply

The Kinetix 300 drive generates +5V and +9V DC for motor feedback power. Short circuit protection and separate common mode filtering for each channel is included.

Motor Feedback Power Specifications

Supply	Reference	Voltage			Current mA	
		Min	Nominal	Max	Min	Max
+5V DC	EPWR_5V	5.13	5.4	5.67	0	400
+9V DC	EPWR_9V	8.3	9.1	9.9	0	275

Pin Orientation for 15-pin Motor Feedback (MF) Connector



Understanding Control Signal Specifications

This section provides a description of the Kinetix 300 drive I/O (IOD), communication, shunt resistor and DC bus (DC), and backup power (BP) connectors.

Digital Inputs

The Kinetix 300 drive has twelve digital inputs. They can be used for travel limit switches, proximity sensors, push buttons and hand shaking with other devices. Each input can be assigned an individual de-bounce time via MotionView or Explicit Message.

The inputs are separated into three groups: A, B, and C. Each group has four inputs and share one common: ACOM, BCOM, and CCOM respectfully. The inputs are labeled individually as IN_A1…IN_A4, IN_B1…IN_B4, and IN_C1…IN_C4.

Travel limit switches, inhibit/enable input, homing, and registration input can be used only on specific digital inputs as shown in table.

Input A3 can be used only for inhibit/enable input function.

Digital Input Assignments

Digital Input	Function
Input A1	Negative travel limit switch
Input A2	Positive travel limit switch
Input A3	Inhibit/enable input
Input A4	N/A
Input B1	N/A
Input B2	N/A
Input B3	N/A
Input B4	N/A
Input C1	N/A
Input C2	N/A
Input C3	N/A
Input C3	Homing and registration input sensor
Input C4	N/A

The digital inputs explicitly shown in Digital Input Assignments table are fixed functions, those inputs can be used only for those functions and those functions can be used only on those inputs. The inputs listed as N/A are configurable to be any of the following inputs:

- Abort Homing
- Abort Index
- Start Homing
- Start Index
- Fault Reset
- Home Sensor

Some of the digital inputs exercise control over functions also under the control of the Output Assembly. In the case of a digital input being mapped to the same function as exists in the Output Assembly the following truth tables applies.

Enable Truth Table (configured for Run)

Drive Input	Value			
Enable Input	Off	Move to On	On	On
Drive Enable bit in Output Assembly(1)	–	On	Move to Off	Move to On
Resulting Drive State	Disabled	Enabled	Disabled	Enabled

(1) Only applicable if EtherNet/IP External Reference mode.

Enable Input (configured for Inhibit)

Drive Input	Value		
Enable Input	On	On	Off
Drive Enable bit in Output Assembly	Move to On	Move to Off	–
Resulting Drive State	Enabled	Disabled	Disabled

Homing Truth Table

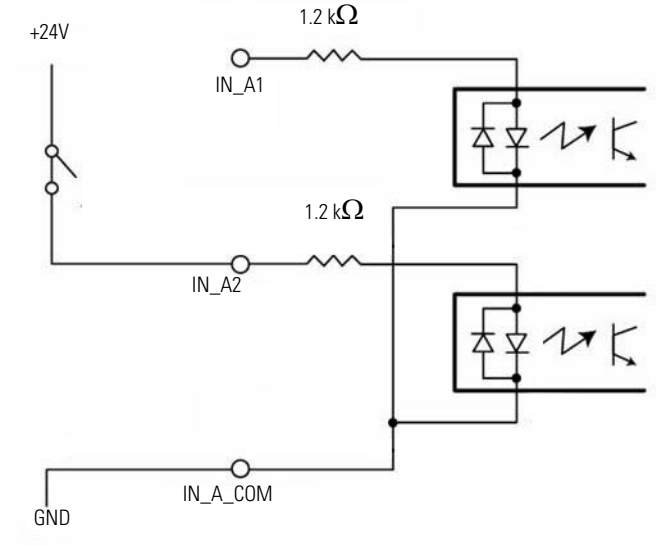
Drive Input	Value					
Start Homing Input	—	—	Move to On	—	—	—
Start Homing bit in Output Assembly	—	—	—	Move to On	—	—
Abort Homing Input	On	—	Off	Off	Move to On	—
Abort Homing bit in Output Assembly	—	On	Off	Off	—	Move to On
Previous Drive State	Enabled	Enabled	Enabled	Enabled	Homing	Homing
Resulting Drive State	Will not home	Will not home	Starts homing	Starts homing	Aborts homing	Aborts homing

Indexing Truth Table

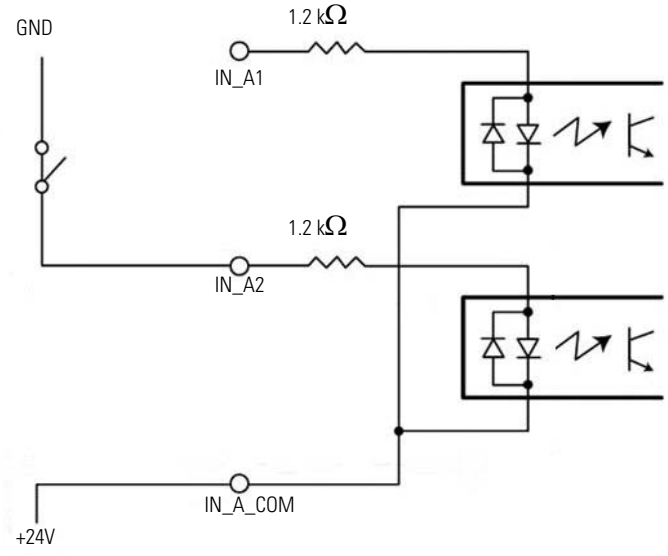
Drive Input	Value					
Start Index Input	—	—	Move to On	—	—	—
Start Motion bit in Output Assembly	—	—	—	Move to On	—	—
Abort Index Input	On	—	Off	Off	Move to On	—
Abort Index bit in Output Assembly	—	On	Off	Off	—	Move to On
Previous Drive State	Enabled	Enabled	Enabled	Enabled	Indexing	Indexing
Resulting Drive State	Will not index	Will not index	Starts indexing	Starts indexing	Aborts indexing	Aborts Indexing

The digital inputs are optically isolated and sinks up to 24V DC. Electrical details are shown in Digital Input Signal Specifications. The inputs can be setup for PNP sourcing or NPN sinking.

Sourcing of Digital Inputs



Sinking of Digital Inputs



Digital Input Signal Specifications

Parameter	Value
Scan time	500 µs
Current, max	9 mA, typical
Input impedance	1.2 kΩ, typical
Voltage range	10…24V DC

Digital Outputs

There are five digital outputs, OUT1…OUT4 and RDY available on the IOD connector. Outputs are optically isolated open collector/emitter and are fully isolated from the drive circuits. Each output, OUT1…OUT4, can be assigned to one of the following functions:

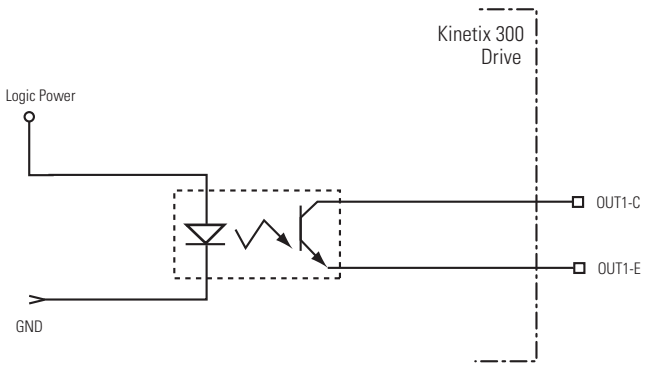
- Not assigned
- Zero speed
- In-speed window
- Current limit
- Run-time fault
- Ready
- Brake (motor brake release)

The Ready Output has a fixed function that becomes active when the drive is enabled and the output power transistors become energized.

Digital Output Signal Specifications

Parameter	Value
Scan time	500 µs
Current, max	100 mA
Voltage range	30V DC, max

Digital Outputs



Analog Reference Input

The analog reference input AIN1+ and AIN1- (IOD-24 and IOD-25) accepts up to a ±10V DC analog signal across AIN1+ and AIN1-, with electrical details shown Analog Signal Input Specifications table on page 49. The analog signal is converted to a digital value with 12 bit resolution (11 bit plus sign). The total reference voltage as seen by the drive is the voltage difference between AIN1+ and AIN1-. If used in Single-ended mode, one of the inputs must be connected to a voltage source while the other one must be connected to Analog Common (ACOM). If used in Differential mode, the voltage source is connected across AIN1+ and AIN1- and the driving circuit common, if available, is connected to the drive Analog Common (ACOM) terminal.

Analog Signal Input Specifications

Parameter	Value
Scan time	0.0625 ms
Current, max	Depend on load
Input impedance	47 kΩ, typical
Voltage range	-10…10V DC

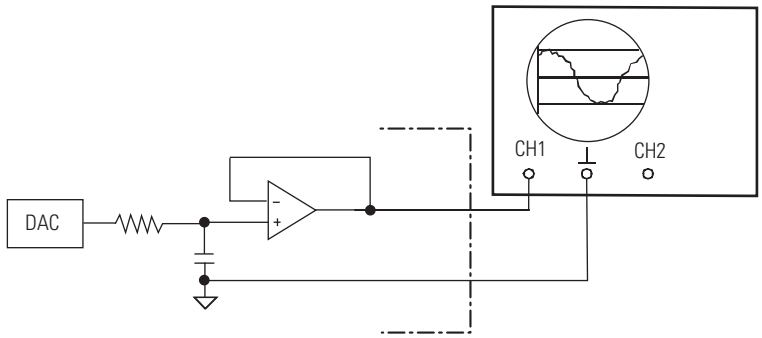
Analog Output

The analog output (AO) on pin IOD-23 has a 10 bit resolution with electrical details shown Analog Output Specifications table on page 50. The analog output is a single-ended signal with reference to Analog Common (ACOM) which can represent the following motor data:

- Not Assigned
- RMS Phase Current
- RMS Peak Current
- Motor Velocity
- Phase Current R
- Phase Current S
- Phase Current T
- Iq Current
- Id Current

IMPORTANT Output values can vary during powerup until the specified power supply voltage is reached.

Analog Output Circuit



Analog Output Specifications

Parameter	Value
Scan time	0.0625 ms
Current, max	10 mA
Voltage range	-10…10V DC

For configuration/setup of the analog outputs, refer to Configure Drive Parameters and System Variables beginning on page 108.

Ethernet Connection

An RJ45 Ethernet connector (port 1) is provided on the Kinetix 300 drive.

Ethernet Communication Specifications

Attribute	Value
Communications	100BASE-TX, full duplex
Cyclic update period	2 ms, min
Auto MDI/MDIX crossover detection/correction	Yes
Cabling	CAT5E or CAT6, unshielded or shielded, 100 m (328 ft)

24V DC Back-Up Power

The Kinetix 300 drive can use an external power supply to power the logic and communication circuit. During a mains input power loss, the logic and communication remains active if an independent 24V power supply is connected to the BP connector.

24V DC Back-Up Power

Attribute	Value
Input voltage	20…26V DC
Current	500 mA
Inrush, max	30 A

Notes:

Connecting the Kinetix 300 Drive System

Introduction

This chapter provides procedures for wiring your Kinetix 300 system components and making cable connections.

Topic	Page
Introduction	53
Understanding Basic Wiring Requirements	53
Grounding Your Kinetix 300 Drive	61
Power Wiring Requirements	63
Wiring Guidelines	65
Wiring the Kinetix 300 Drive Connectors	66
Apply the Motor Cable Shield Clamp	74
Understanding Feedback and I/O Cable Connections	75
Wiring I/O Connector	77
Wiring Feedback Connector	78
Understanding Shunt Resistor Connections	79
Connecting Your Ethernet Cables	80

Understanding Basic Wiring Requirements

This section contains basic wiring information for the Kinetix 300 drive.

ATTENTION

Plan the installation of your system so that you can perform all cutting, drilling, tapping, and welding with the system removed from the enclosure. Because the system is of the open type construction, be careful to keep any metal debris from falling into it. Metal debris or other foreign matter can become lodged in the circuitry, which can result in damage to components.

SHOCK HAZARD

To avoid hazard of electrical shock, perform all mounting and wiring of the Bulletin 2097 drive prior to applying power. Once power is applied, connector terminals may have voltage present even when not in use.

IMPORTANT This section contains common PWM servo system wiring configurations, size, and practices that can be used in a majority of applications. National Electrical Code, local electrical codes, special operating temperatures, duty cycles, or system configurations take precedence over the values and methods provided.

Building Your Own Cables

IMPORTANT Factory-made cables are designed to minimize EMI and are recommended over hand-built cables to optimize system performance.

- Connect the cable shield to the connector shells on both ends of the cable with a complete 360° connection.
- Use twisted pair cable whenever possible. Twist differential signals with each other and twist single-ended signals with the appropriate ground return.

Refer to the Kinetix Motion Control Selection Guide, publication GMC-SG001, for low-profile connector kit, drive-end (mating) connector kit, and motor-end connector kit catalog numbers.

Routing Power and Signal Wiring

Be aware that when you route power and signal wiring on a machine or system, radiated noise from nearby relays, transformers, and other electronic drives can be induced into motor or encoder feedback signals, input/output communication, or other sensitive low voltage signals. This can cause system faults and communication anomalies.

Refer to Minimizing Electrical Noise on page 22 for examples of routing high and low voltage cables in wireways. Refer to the System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001, for more information.

Determining Your Type of Input Power

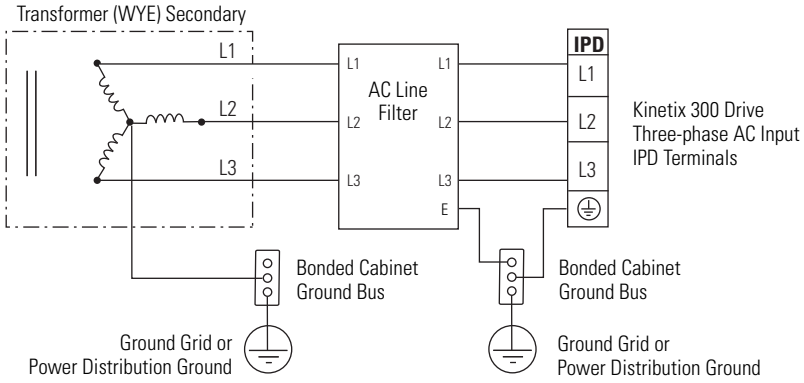
On the following pages are examples of typical single-phase and three-phase facility input power wired to single-phase and three-phase Kinetix 300 drives.

The grounded power configuration allows you to ground your single-phase or three-phase power at a neutral point. Match your secondary to one of the examples and be certain to include the grounded neutral connection.

Three-phase Power Wired to Three-phase Drives

The following examples illustrate grounded three-phase power wired to three-phase Kinetix 300 drives when phase-to-phase voltage is within drive specifications.

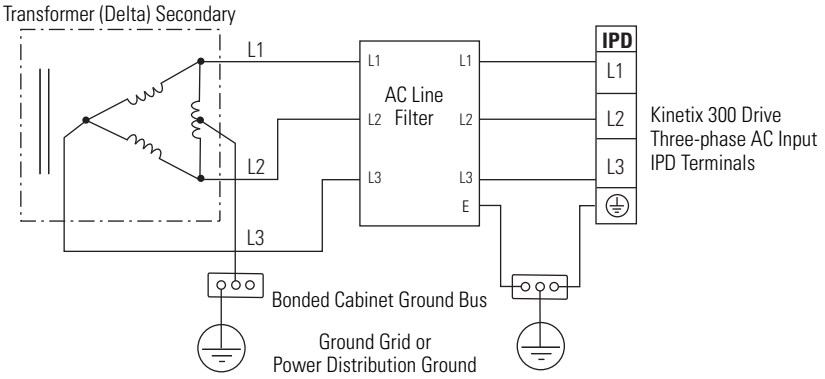
Three-phase Power Configuration (WYE Secondary)



Feeder and branch short circuit protection is not illustrated.

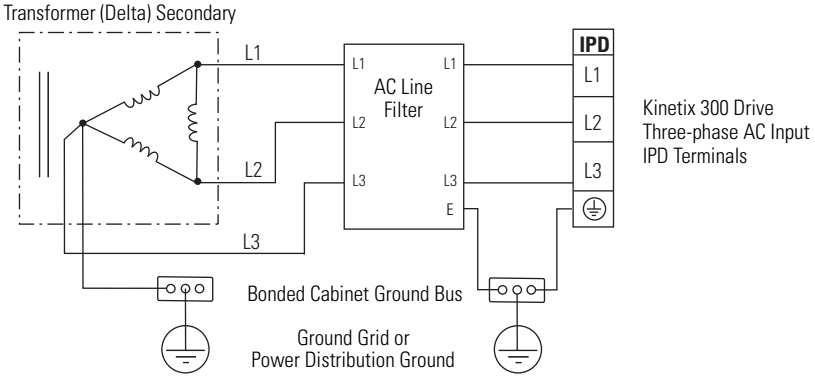
IMPORTANT The next two configurations are for 230V AC installations only. They are not recommended for 400/480V AC installation.

Three-phase Power Configuration (preferred Delta secondary)



Feeder and branch short circuit protection is not illustrated.

Three-phase Power Configuration (tolerated Delta secondary)

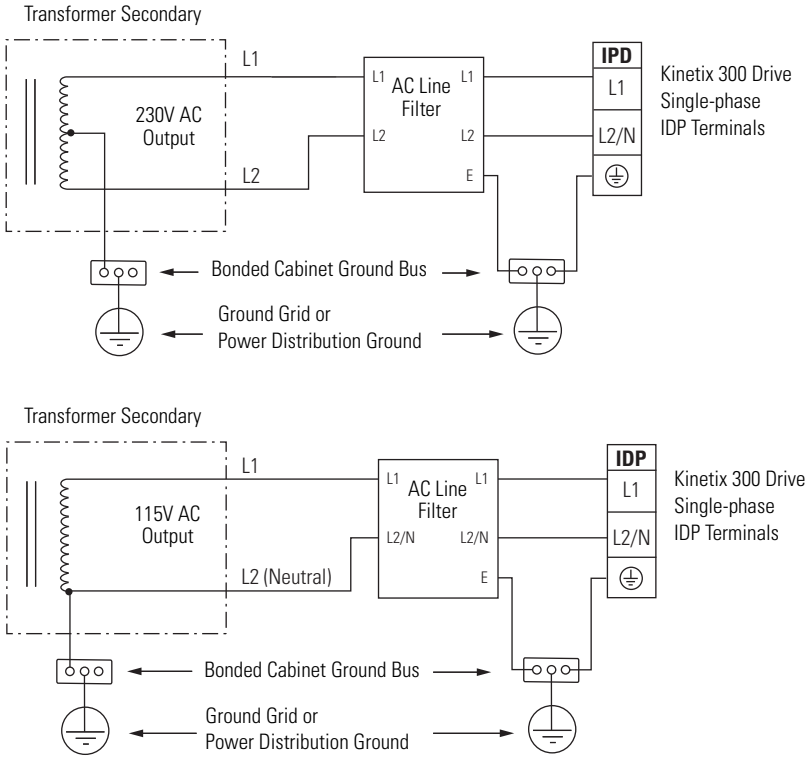


Feeder and branch short circuit protection is not illustrated.

Single-phase Power Wired to Single-phase Drives

The following examples illustrate grounded single-phase power wired to single-phase Kinetix 300 drives when phase-to-phase voltage is within drive specifications.

Single-phase Grounded Power Configurations



Reducing transformer output reduces motor speed. Feeder and branch short circuit protection is not illustrated.

Isolation Transformer in Grounded Power Configurations

When using an isolation transformer, attach a chassis ground wire to the neutral connection. This accomplishes the following:

- Prevents the system from floating and thereby avoids any high voltages that might otherwise occur, for example due to static electricity.
- Provides a solid earth path for fault conditions.

ATTENTION

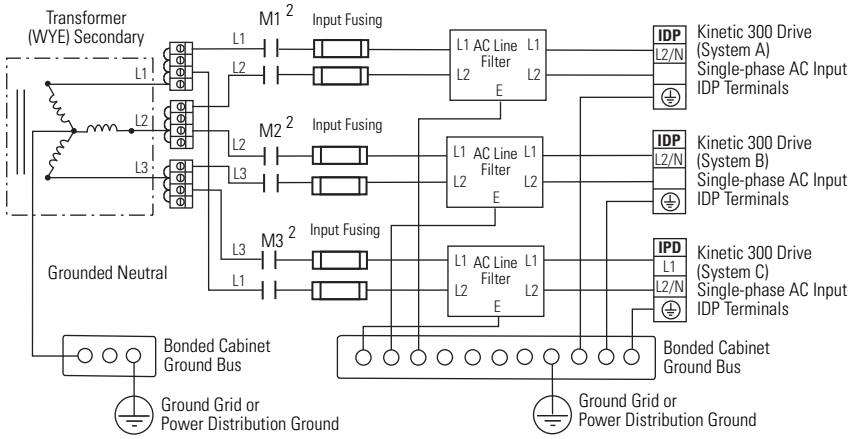
If the supply transformer is an auto transformer (not recommended), a chassis earth ground should not be added.

A chassis earth ground should already be included elsewhere in the system, and adding another would create a short.

Three-phase Power Wired to Single-phase Drives

The following example illustrate grounded three-phase power wired to single-phase Kinetix 300 drives when phase-to-phase voltage is within drive specifications.

Single-phase Amplifiers on Three-phase Power (WYE)



1 AC line filter is optional, but is required for CE compliance.

2 Contactors (MI, M2, and M3) may be optional. For more information, refer to Understanding the Machinery Directive, publication SHB-900.

Feeder short circuit protection is not illustrated.

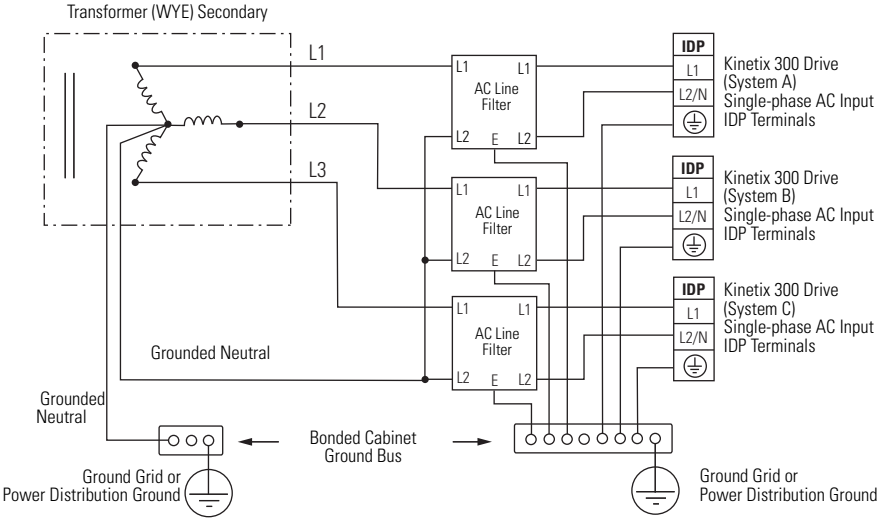
The following example illustrates grounded three-phase power wired to single-phase Kinetix 300 drives when phase-to-phase voltage exceeds drive specifications.

A neutral must be connected when single-phase drives are attached to a three-phase isolating transformer secondary. It is not necessary that all three-phases be loaded with drives, but each drive must have its power return via the neutral connection.

ATTENTION

Failure to connect the neutral can result in supply voltage swings at the individual drives. This occurs when the neutral point moves vectorially as a result of load variations normally experienced by the individual drives. The supply voltage swing may cause undervoltage and overvoltage trips on the drives, and the drive can be damaged if the overvoltage limit is exceeded.

Single-phase Amplifiers (one AC line filter per drive)



Feeder and branch short circuit protection is not illustrated.

IMPORTANT

Providing an EMC line filter for each drive is the preferred configuration, and required for CE compliance.

If a three-phase line filter is used to feed multiple single-phase drives (not recommended), it is important that the filter include a neutral connection as shown above. This applies if three-phase is brought directly into the filter and no isolating transformer present.

Voiding of CE Compliance

The three-phase and neutral in-line filter applications described above may not be adequate from an EMC aspect for CE compliance. Therefore, EMC validity and CE marking by Rockwell Automation is voided when three-phase and neutral in line filters are used.

ATTENTION

The three-phase isolation transformer and neutral in-line filter applications described in this document have not been tested for EMC by Rockwell Automation, and products used in such installations are not considered CE marked by Rockwell Automation.

If this three-phase isolation transformer and neutral in-line filter application is used, the responsibility for EMC validation lies with the user and CE marking of the system becomes the user's responsibility.

If CE compliance is a customer requirement, single-phase line filters which have been tested by Rockwell and specified for the product should be used. Refer to AC Line Filter Specifications on page 132 for catalog numbers.

Grounding Your Kinetix 300 Drive

All equipment and components of a machine or process system should have a common earth ground point connected to their chassis. A grounded system provides a safety ground path for short circuit protection. Grounding your modules and panels minimize shock hazard to personnel and damage to equipment caused by short circuits, transient overvoltages, and accidental connection of energized conductors to the equipment chassis. For CE grounding requirements, refer to CE Requirements in Chapter 1.

IMPORTANT To improve the bond between the Kinetix 300 drive and subpanel, construct your subpanel out of zinc plated (paint-free) steel.

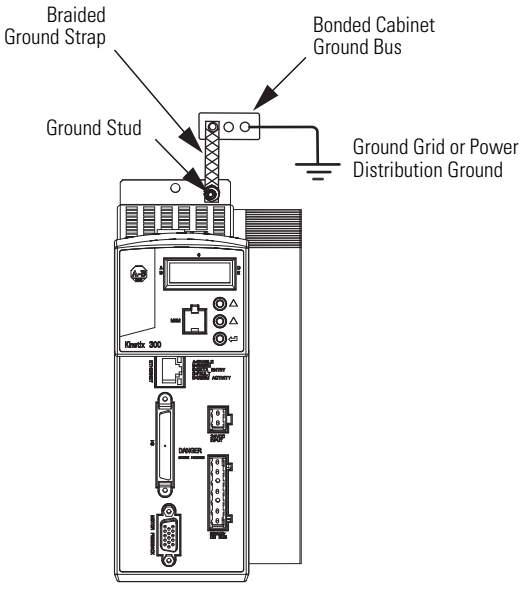
Grounding Your System to the Subpanel

ATTENTION

The National Electrical Code contains grounding requirements, conventions, and definitions. Follow all applicable local codes and regulations to safely ground your system. Refer to the illustration below for details on grounding your Kinetix 300 drive. Refer to Appendix B for the power wiring diagram for your Kinetix 300 drive.

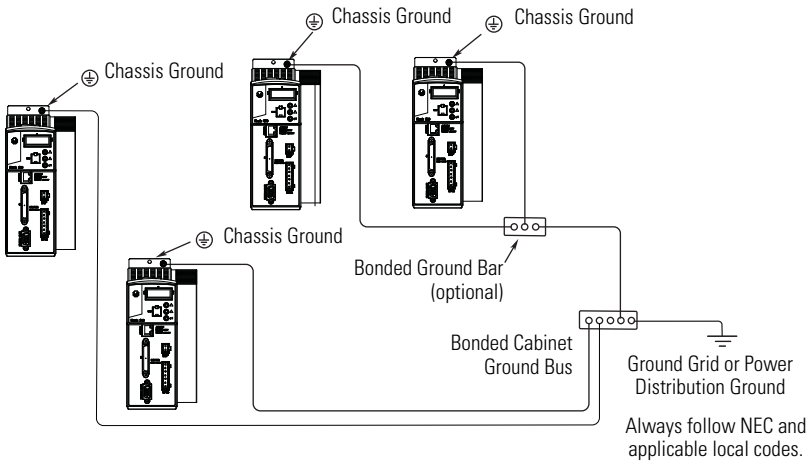
If the Kinetix 300 drive is mounted on a painted subpanel, ground to a bonded cabinet ground bus using a braided ground strap or 4.0 mm^2 (12 AWG) solid copper wire 100 mm (3.9 in.) long.

Connecting the Braided Ground Strap Example



For dimensions, Product Dimensions on page 134.

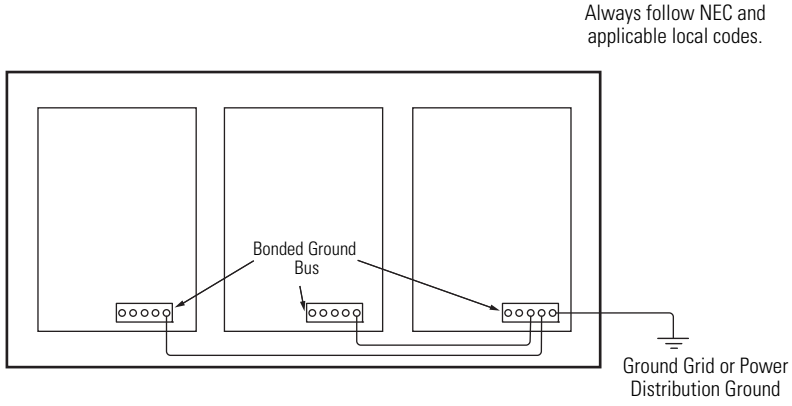
Chassis Ground Configuration (multiple Kinetix 300 drives on one panel)



Grounding Multiple Subpanels

To ground multiple subpanels, refer to the figure below. HF bonding is not illustrated. For information, refer to Bonding Multiple Subpanels on page 24.

Subpanels Connected to a Single Ground Point



Power Wiring Requirements

Wire should be copper with 75 °C (167 °F) minimum rating. Phasing of main AC power is arbitrary and earth ground connection is required for safe and proper operation.

Refer to Power Wiring Examples on page 137 for interconnect diagrams.

IMPORTANT The National Electrical Code and local electrical codes take precedence over the values and methods provided.

Kinetix 300 Drive Power Wiring Requirements

Cat. No.	Description	Terminals		Recommended Wire Size mm² (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
		Pin	Signal			
2097-V31PR0 2097-V32PR0 2097-V32PR2 2097-V33PR1 2097-V33PR3 2097-V34PR3 2097-V34PR5 2097-V34PR6	Mains input power	IPD-1 IPD-2 IPD-3 IPD-4	L3 L2 L1 PE	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V32PR4 2097-V33PR5				4.0 (12)	7 (0.28)	0.5 (4.5)
2097-V31PR2 2097-V33PR6				6.0 (10)	7 (0.28)	0.56…0.79 (5.0…7.0)
2097-V31PR0 2097-V32PR0 2097-V32PR2 2097-V32PR4 2097-V33PR1 2097-V33PR3 2097-V33PR5 2097-V34PR3 2097-V34PR5 2097-V34PR6 2097-V31PR2	Motor power	MP-1 MP-2 MP-3 MP-4	PE W V U	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V33PR6				4.0 (12)	7 (0.28)	0.5 (4.5)

Kinetix 300 Drive Power Wiring Requirements (continued)

Cat. No.	Description	Terminals		Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
		Pin	Signal			
2097-V31PR0 2097-V32PR0 2097-V32PR2 2097-V32PR4 2097-V33PR1 2097-V33PR3 2097-V33PR5 2097-V34PR3 2097-V34PR5 2097-V34PR6 2097-V31PR2	Brake resistor and DC bus(1)	BC-1 BC-2 BC-3 BC-4 BC-5	B+ B+ BR B- B-	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V33PR6				4.0 (12)	7 (0.28)	0.5 (4.5)
2097-V3*x*PR*x*	Control back-up power	BP-1 BP-2	+24V DC Return	1.5 (16)	6 (0.25)	0.5 (4.5)
2097-V3*x*PR*x*	Safe torque-off	STO-1 (2) STO-2 (2) STO-3 STO-4 STO-5 STO-6	+24V DC Control Control COM Safety Status Safety Input 1 Safety COM Safety Input 2			

(1) Use for shunt resistor connection only.

(2) Use for bypassing the STO circuit only.

ATTENTION

To avoid personal injury and/or equipment damage, make sure installation complies with specifications regarding wire types, conductor sizes, branch circuit protection, and disconnect devices. The National Electrical Code (NEC) and local codes outline provisions for safely installing electrical equipment.

To avoid personal injury and/or equipment damage, make sure motor power connectors are used for connection purposes only. Do not use them to turn the unit on and off.

To avoid personal injury and/or equipment damage, make sure shielded power cables are grounded to prevent potentially high voltages on the shield.

Shunt Resistor Power Wiring Requirements

Accessory	Description	Connects to Terminals		Recommended Wire Size mm^2 (AWG)	Torque Value N•m (lb•in)
		Pin	Signal		
2097-R*x*	Shunt Resistor	BC-1 or BC-2	B+	2.5 (14)	0.5 (4.5)
		BC-3	BR		

Wiring Guidelines

Use these guidelines as a reference when wiring the connectors on your Kinetix 300 drive power modules.

IMPORTANT For connector locations of the Kinetix 300 drives, refer to Kinetix 300 Drive Connectors and Indicators on page 32.

When tightening screws to secure the wires, refer to the tables beginning on page 63 for torque values.

When removing insulation from wires, refer to the tables beginning on page 63 for strip lengths.

IMPORTANT To improve system performance, run wires and cables in the wireways as established in Establishing Noise Zones on page 25.

Follow these steps when wiring the connectors on your Kinetix 300 drive modules.

1. Prepare the wires for attachment to each connector plug by removing insulation equal to the recommended strip length.

   IMPORTANT Use caution not to nick, cut, or otherwise damage strands as you remove the insulation.

2. Route the cable/wires to your Kinetix 300 drive.
3. Insert wires into connector plugs.

   Refer to connector pinout tables in Chapter 3 or the interconnect diagrams in Appendix B.

4. Tighten the connector screws.
5. Gently pull on each wire to make sure it does not come out of its terminal; reinsert and tighten any loose wires.
6. Insert the connector plug into the module connector.

Wiring the Kinetix 300 Drive Connectors

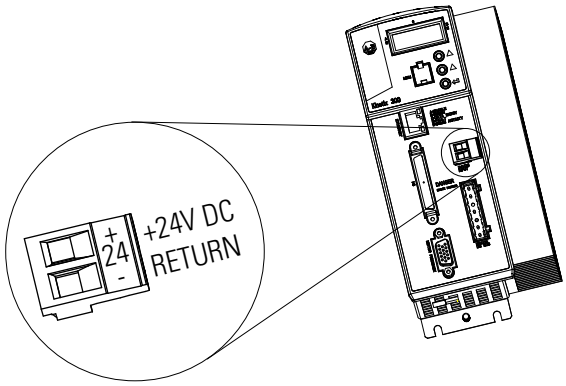
This section provides examples and wiring tables to assist you in making connections to the Kinetix 300 drive.

Wiring the Safe Torque-off (STO) Connector

To wire the safe-off connector, refer to Appendix D on page 155.

Wiring the Back-up Power (BP) Connector

Kinetix 300 Drive (BP) Connector



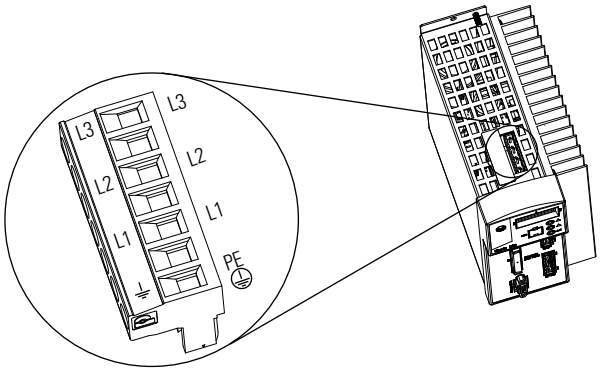
Kinetix 300 Drive, Front View

Back-up Power (BP) Connector

Cat. No.	Terminal		Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
	Pin	Signal			
2097-V3*x*PR*x*	BP-1	+24V DC	1.5 (16)	6 (0.25)	0.5 (4.5)
	BP-2	Return			

Wiring the Input Power (IPD) Connector

Kinetix 300 Drive (IPD) connector



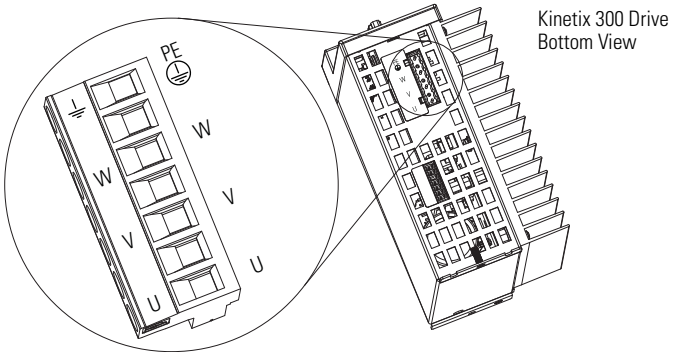
Input Power (IPD) Connector

Cat. No.	Terminal		Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
	Pin	Signal			
2097-V31PR0 2097-V32PR0 2097-V32PR2 2097-V33PR1 2097-V33PR3 2097-V34PR3 2097-V34PR5 2097-V34PR6	IPD-1 IPD-2 IPD-3 IPD-4	L3 L2 L1 PE	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V32PR4 2097-V33PR5			4.0 (12)	7 (0.28)	0.5 (4.5)
2097-V31PR2 2097-V33PR6			6.0 (10)	7 (0.28)	0.56…0.79 (5.0…7.0)

Wiring the Motor Power (MP) Connector

Connections to the motor power (MP) connector include rotary motors, and rotary motor driven actuators.

Kinetix 300 Drive (MP) Connector



Cable Shield Terminations

Factory-supplied motor power cables for MP-Series and TL-Series motors and actuator are shielded. The braided cable shield must terminate near the drive during installation. Remove small portion of the cable jacket to expose the shield braid and clamp the exposed shield to the panel.

ATTENTION

To avoid hazard of electrical shock, ensure shielded power cables are grounded at a minimum of one point for safety.

IMPORTANT

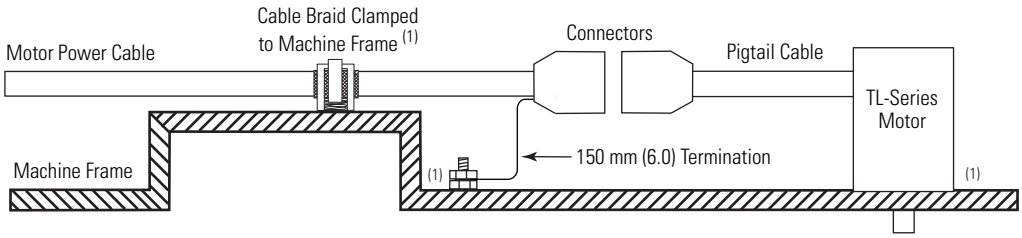
For TL-Series motors, also connect the 152 mm (6.0 in.) termination wire to the closest earth ground.

Refer to Pigtail Terminations on page 69 for more information.

Pigtail Terminations

TL-Series motors have a short pigtail cable which connects to the motor, but is not shielded. The preferred method for grounding the TL-Series power cable on the motor side is to expose a section of the cable shield and clamp it directly to the machine frame. The motor power cable also has a 150 mm (6.0 in.) shield termination wire with a ring lug that connects to the closest earth ground. Use this method in addition to the cable clamp. The termination wire may be extended to the full length of the motor pigtail if necessary, but it is best to connect the supplied wire directly to ground without lengthening.

Pigtail Terminations



(1) Remove paint from machine frame to ensure proper HF-bond between machine frame and motor case, shield clamp, and ground stud.

Motor Power Cable Compatibility

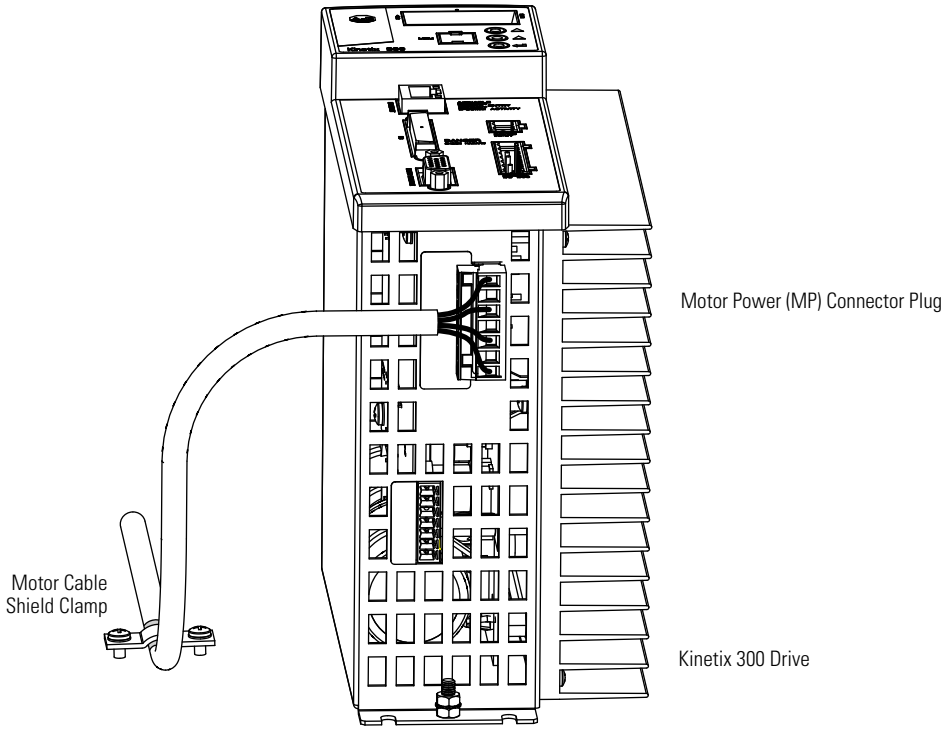
Motor/Actuator	Connector	Motor/Actuator Cat. No.	Motor Power Cables (with brake wires)	Motor Power Cables (without brake wires)
MP-Series (Bulletin MPL)	Circular DIN	MPL-A/B15*xxx* and MPL-A/B2*xxx*	2090-XXNPMF-*xx*S*xx* (standard) or 2090-CPBM4DF-*xx*AF*xx* (continuous-flex)	2090-CPWM4DF-*xx*AF*xx* (continuous-flex)
		MPL-A/B3*xxx*, MPL-A/B4*xxx*, MPL-A/B45*xxx*, MPL-A/B5*xxx*,	2090-XXNPMF-*xx*S*xx* (standard) 2090-CPBM7DF-*xx*AF*xx* (1) (continuous-flex)	2090-CPWM7DF-*xx*AF*xx* (1) (continuous-flex)
MP-Series (Bulletin MPS)		MPS-A/B*xxxx*	2090-XXNPMF-*xx*S*xx* (standard) or 2090-CPBM4DF-*xx*AF*xx* (continuous-flex)	2090-CPWM4DF-*xx*AF*xx* (continuous-flex)
MP-Series (Bulletin MPAS)		MPAS-A/B*xxxx*		
MP-Series (Bulletin MPAR)		MPAR-A/B1*xxx* and MPAR-A/B2*xxx*		
MP-Series (Bulletin MPM)		MPM-A/B*xxxx*	2090-XXNPMF-*xx*S*xx* (standard) 2090-CPBM7DF-*xx*AF*xx* (1) (continuous-flex)	2090-CPWM7DF-*xx*AF*xx* (1) (continuous-flex)
MP-Series (Bulletin MPF)		MPF-A/B*xxxx*		
MP-Series (Bulletin MPAR)		MPAR-A/B3*xxx*		
MP-Series (Bulletin MPAI)		MPAI-A/B*xxxx*		
TL-Series (Bulletin TLY)	Circular Plastic	TLY-A*xxxx*	2090-CPBM6DF-16AA*xx* (standard)	2090-CPWM6DF-16AA*xx* (standard)
TL-Series (Bulletin TLAR)		TLAR-A/B*xxxx*		

(1) For motors with circular DIN connectors, either 2090-CP*x*M7DF-*xx*AF*xx*, 2090-CP*x*M4DF-*xx*AF*xx*, or 2090-XXNPMF-*xx*S*xx* cables are compatible. However, you must remove the motor-side o-ring when using 2090-CP*x*M7DF-*xx*AF*xx* cables.

The following diagram shows an example of three-phase power wires for motors/actuators that have no brakes. Thermal switch wires are included in the feedback cable.

Refer to Kinetix 300 Drive/Rotary Motor Wiring Examples beginning on page 141 for interconnect diagrams.

Motor Power Terminations (three-phase wires only)

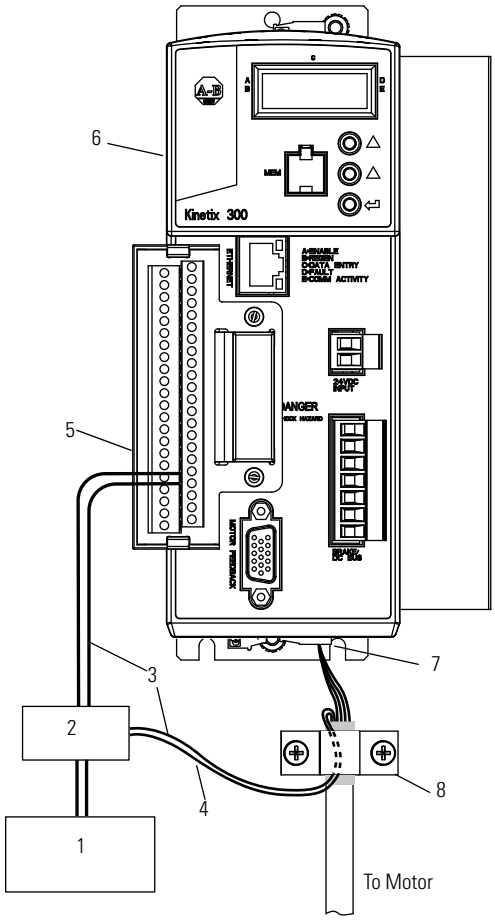


The cable shield clamp shown above is mounted to the subpanel. Ground and secure the motor power cable in your system following instructions on page 74.

The following diagram shows an example of wiring with three-phase power wires and brake wires. The brake wires have a shield braid (shown below as gray) that folds back under the cable clamp before the conductors are attached to the motor brake circuit. Thermal switch wires are included in the feedback cable.

Refer to Kinetix 300 Drive/Rotary Motor Wiring Examples beginning on page 141 for interconnect diagrams.

Motor Power Terminations (three-phase and brake wires)



Item	Description
1 (1)	24V power supply
2 (1)	Relay and diode assembly.(3)
3	Minimize unshielded wires in brake circuit.
4	MP-Series cable brake wires.

Item	Description
5	I/O (IOD) connector.(2)
6	2097-V3*x*PR*x* Kinetix 300 drive.
7	Motor power (MP) connector.
8	Cable clamp.(4)

(1) User supplied. Size as required by motor brake, See Motor Brake Currents on page 148.

(2) Configure one emitter and collector pair from the Digital Outputs, OUT-1… OUT-4, pins 43…50, as Brake+ and Brake - using MotionView software. Wire the output as sourcing and set brake engage and disengage times for motor selected. Motor brake is active on enable. For Digital Output specifications, refer to page 48

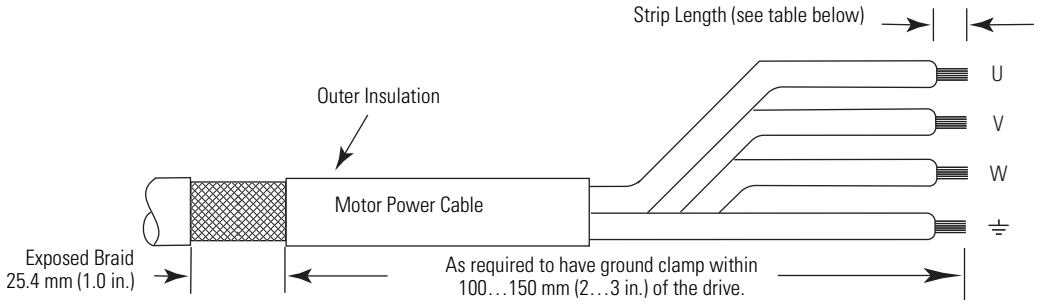
(3) Diode 1N4004 rated 1.0A @ 400V DC. See Wiring Examples beginning on page 141.

(4) Exposed shield under clamp and place within 2…3 in. (50…75 mm) of drive, see page 74 for details.

The cable shield clamp shown above is mounted to the subpanel. Ground and secure the power cable in your system following instructions on page 74.

Cable shield and lead preparation is provided with most Allen-Bradley cable assemblies. Follow these guidelines if your motor power cable shield and wires require preparation.

Cable Shield and Lead Preparation



Refer to Shunt Resistor Wiring Example beginning on page 141 for interconnect diagrams.

Motor Power (MP) Connector

Servo Motor	MP Connector	
MP-Series, TL-Series	**MP Pin**	**Signal**
U / Brown	1	U
V / Black	2	V
W / Blue	3	W
⏚ Green/Yellow	4	⏚

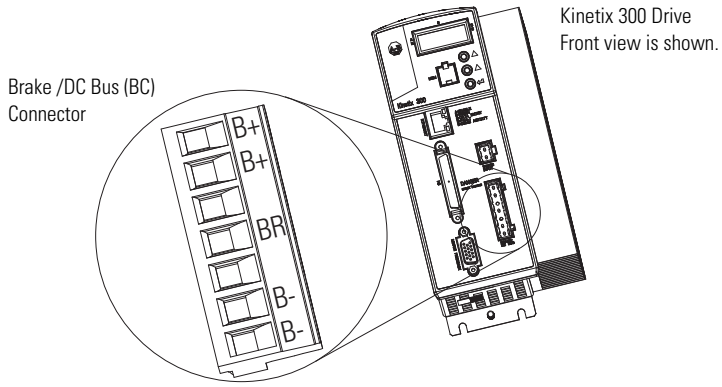
Termination Specifications

Cat. No.	Recommended Wire Size mm^2 (AWG)	Strip Length mm (in.)	Torque Value N•m (lb•in)
2097-V31PR0 2097-V32PR0 2097-V32PR2 2097-V32PR4 2097-V33PR1 2097-V33PR3 2097-V33PR5 2097-V34PR3 2097-V34PR5 2097-V34PR6 2097-V31PR2	2.5 (14)	7 (0.28)	0.5 (4.5)
2097-V33PR6	4.0 (12)		

Wiring the Shunt Resistor

If you are using a shunt resistor in your system, wire it to the BC connector using instructions found in the Kinetix 300 Shunt Resistor Installation Instructions, publication 2097-IN002.

Brake/DC Bus (BC) Connector

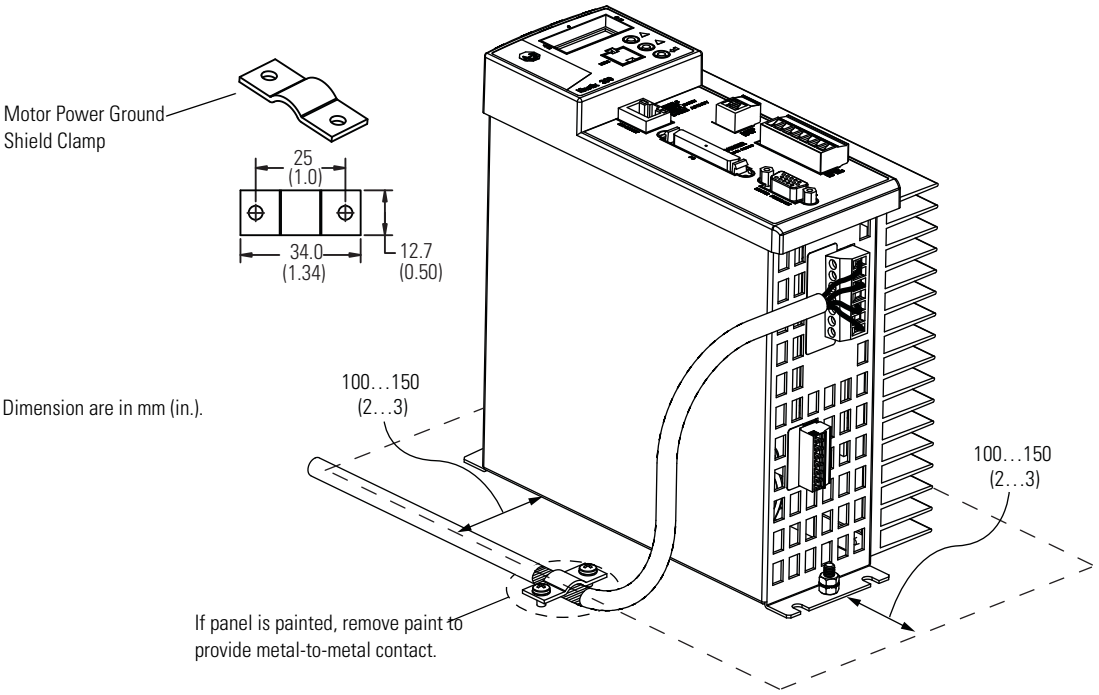


Apply the Motor Cable Shield Clamp

This procedure assumes you have completed wiring your motor power (MP) connector and are ready to apply the cable shield clamp.

Follow these steps to apply the motor cable shield clamp.

1. Locate a suitable position for installing cable shield clamp within 100…150 mm (2…3 in.) of the drive.



2. Layout and drill holes for cable clamp.

ATTENTION

Plan the installation of your system so that you can perform all cutting, drilling, tapping, and welding with the system removed from the enclosure. Because the system is of the open type construction, be careful to keep any metal debris from falling into it. Metal debris or other foreign matter can become lodged in the circuitry, which can result in damage to components.

3. Locate the position on the motor power cable that comes under the clamp and remove about an inch of the cable jacket to expose the shield braid.

4. Position the exposed portion of the cable braid directly in line with the clamp.

5. Clamp the exposed shield to the panel using the clamp and 2 #6-32 x 1 screws provided.

6. Repeat steps 1…5 for each Kinetix 300 drive you are installing.

Understanding Feedback and I/O Cable Connections

Factory made cables with premolded connectors are designed to minimize EMI and are recommended over hand-built cables to improve system performance. However, other options are available for building your own feedback and I/O cables.

Options for Connecting Motor Feedback

Connection Option	Cat. No.	Cable	Using This Type of Cable
Premolded connectors	N/A	Motor feedback	Refer to the table below for the premolded motor feedback cable available for your motor.
Low-profile connector	2090-K2CK-D15M	Motor feedback	Refer to the table below for the flying-lead cable available for your motor.
I/O Terminal Block	2097-TB1	I/O interface	User-supplied flying-lead cable.

Motor Feedback Cables for Specific Motor/Feedback Combinations

Motor Cat. No.	Feedback Type	Feedback Cable		Pinout
		Premolded	Flying-lead	
MPL-A/B3*xxx*-M/S…MPL-A/B45*xxx*-M/S	High-resolution encoder	N/A	2090-XXNFMF-S*xx* (standard) 2090-CFBM7DF-CDAF*xx* (continuous-flex)	page 76
MPL-A/B3*xxx*-H…MPL-A/B45*xxx*-H				
MPM-A/B*xxxxx*-M/S				
MPF-A/B*xxxx*-M/S				
MPAR-A/B3*xxxx*				
MPAI-A/B*xxxx*				
MPL-A/B15*xxx*-V/E MPL-A/B2*xxx*-V/E			2090-XXNFMF-S*xx* (standard) 2090-CFBM4DF-CDAF*xx* (continuous-flex)	
MPS-A/B*xxxx*-M/S				
MPAR-A/B1*xxxx and* MPAR-A/B2*xxxx*				
MPAR-A/B3*xxxx*				
MPL-A/B15*xxx*-H MPL-A/B2*xxx*-H	Incremental encoder			
TLY-A*xxxx*-B	High-resolution encoder		2090-CFBM6DF-CBAA*xx* (standard) or	page 77
TLAR-A*xxxxx*				
TLY-A*xxxx*-H	Incremental encoder	2090-CFBM6DD-CCAA*xx*		

Flying-lead Feedback Cable Pin-outs

2090-XXNFMF-S*xx* or 2090-CFBM*x*DF-CDAF*xx* Feedback Cable

Circular DIN Connector	High-resolution Feedback		Incremental Feedback	Drive MF Connector Pin
Rotary Motor Connector Pin	9V Encoder	5V Encoder	5 V Encoder	
1	Sin+	Sin+	AM+	1
2	Sin-	Sin-	AM-	2
3	Cos+	Cos+	BM+	3
4	Cos-	Cos-	BM-	4
5	Data+	Data+	IM+	5
6	Data-	Data-	IM-	10
9	Reserved	EPWR_5V	EPWR_5V	14
10	Reserved	ECOM	ECOM	6
11	EPWR_9V	Reserved	Reserved	7
12	ECOM	Reserved	Reserved	6
13	TS+	TS+	TS+	11
14	TS-	TS-	TS-	–
15	Reserved	Reserved	S1	12
16	Reserved	Reserved	S2	13
17	Reserved	Reserved	S3	8

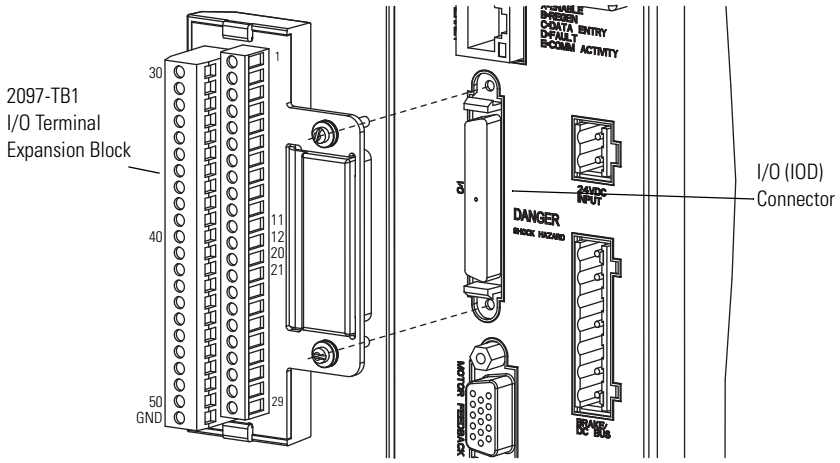
2090-CFBM6DF-CBAA*xx* Feedback Cable

Rotary Motor Connector Pin	High Resolution	Incremental Feedback	Drive MF Connector Pin
	TLY-A*xxxx*-B	**TLY-A*xxxx*-H**	
6	BAT+	Reserved	BAT+
9	Reserved	AM+	1
10		AM-	2
11		BM+	3
12		BM-	4
13	DATA+	IM+	5
14	DATA-	IM-	10
15	Reserved	S1	12
17		S2	13
19		S3	8
22	EPWR 5V	EPWR 5V	14
23	ECOM and BAT-	ECOM	6
24	Shield	Shield	Connector housing

Wiring I/O Connector

Connect your I/O wires to the IOD connector using a 2097-TB1 I/O Terminal Expansion Block. Wiring and installation instructions are found in the Kinetix 300 I/O Terminal Expansion Block Installation Instructions, publication 2097-IN005.

Kinetix 300 Drive (IOD connector and terminal block)



Wiring Feedback Connector

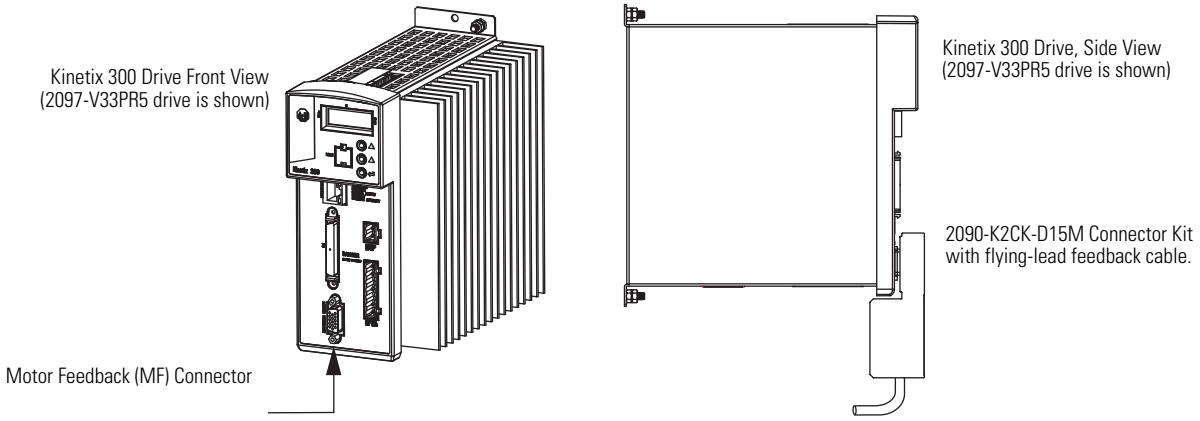
These procedures assume you have mounted your Kinetix 300 system, completed all power wiring, and are ready to connect your feedback.

Wiring Low-profile Connector Kit

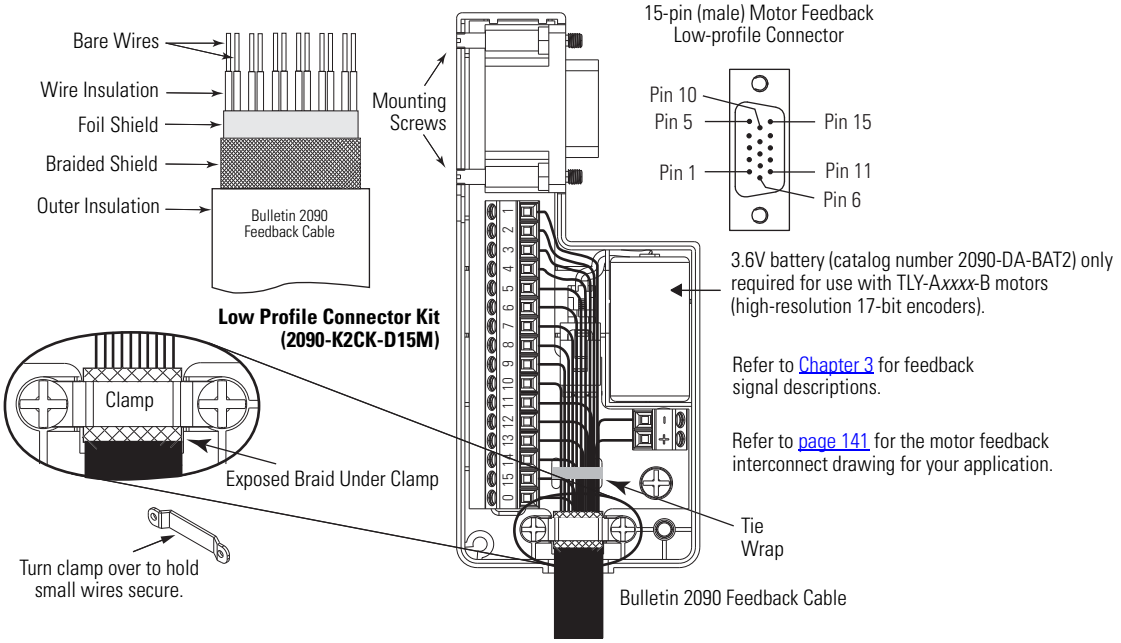
The 2090-K2CK-D15M low-profile connector kit is suitable for terminating flying-lead motor feedback cables. Use it with the Kinetix 300 drive and all motors with incremental or high-resolution feedback. It has a 15-pin, male, D-sub connector and is compatible with all Bulletin 2090 feedback cables.

TLY-A*xxxxx*-B high-resolution motors with 17-bit encoder require a 3.6V battery, purchased separately, (catalog number 2090-DA-BAT2).

Kinetix 300 Drive (MF connector)


Kinetix 300 Drive Front View
(2097-V33PR5 drive is shown)
Motor Feedback (MF) Connector
Kinetix 300 Drive, Side View
(2097-V33PR5 drive is shown)
2090-K2CK-D15M Connector Kit
with flying-lead feedback cable.

Wiring (15-Pin) Flying-lead Feedback Cable Connections
2090-K2CK-D15M Connector Kit



Understanding Shunt Resistor Connections

Follow these guidelines when wiring your 2097-R*x* shunt resistor.

IMPORTANT When tightening screws to secure the wires, refer to the tables beginning on page 63 for torque values.

IMPORTANT To improve system performance, run wires and cables in the wireways as established in Chapter 2.

- Refer to Shunt Resistors on page 28 for noise zone considerations.
- Refer to Shunt Resistor Wiring Example on page 140.
- Refer to the installation instructions provided with your Bulletin 2097 shunt resistor, publication 2097-IN002.

Connecting Your Ethernet Cables

This procedure assumes you have your Logix Ethernet/IP module and Kinetix 300 drive mounted and ready to connect the network cables.

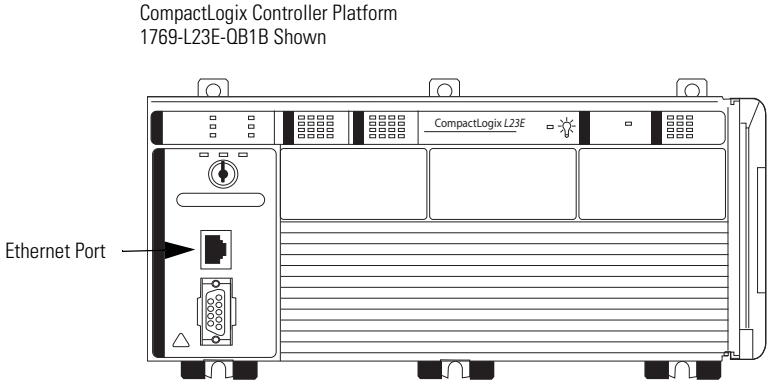
The EtherNet/IP network is connected using the Port 1 connector. Refer to page 32 to locate the Ethernet connector on your Kinetix 300 drive. Refer to the figure below to locate the connector on your Logix communication module.

Shielded Ethernet cable is available in lengths up to 78 m (256 ft). However, the total length of Ethernet cable connecting drive-to-drive, drive-to-controller, or drive-to-switch must not exceed 100 m (328 ft).

If the entire channel is constructed of stranded cable (no fixed cable), then this is the equation for calculating maximum length:

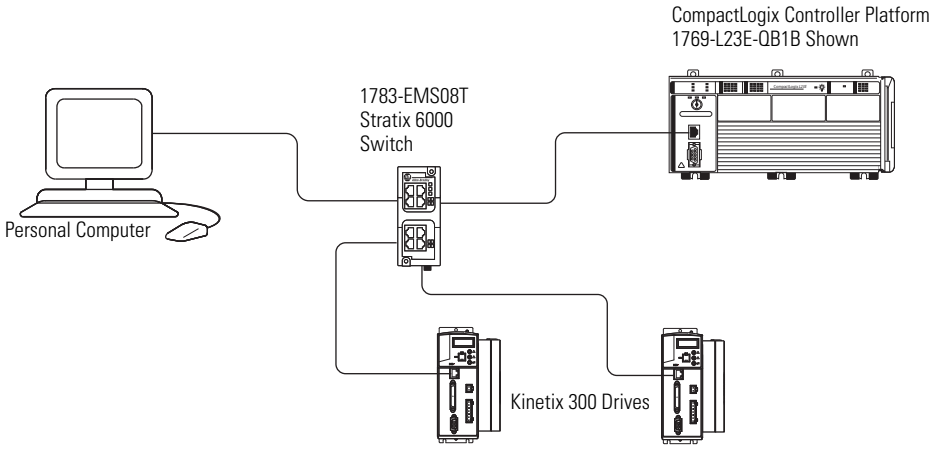
Maximum Length = (113-2N)/y, meters
where N = the number of connections in the channel
and y = the loss factor compared to fixed cable (typically 1.2…1.5).

Compact Logix Ethernet Port Location



The Port 1 Ethernet connection is used for connecting to a web browser and configuring your Logix module.

Ethernet Wiring Example - External Switch



Configure and Start Up the Kinetix 300 Drive

Introduction

This chapter provides procedures for configuring your Kinetix 300 drive components.

Topic	Page
Introduction	81
Keypad Input	82
Configure the Kinetix 300 Drive Ethernet IP Address	84
Use the Kinetix 300 MotionView OnBoard Tool	89
Configure the Logix EtherNet/IP Interface Module	97
Apply Power to the Kinetix 300 Drive	101
Test and Tune the Axis	102
Tune the Axis	103
Select Drive Operating Mode	105
Configure Master Gearing Mode	106
Configure Drive Parameters and System Variables	108
Configuring Drive Mode Using Explicit Messaging	111

Keypad Input

The Kinetix 300 drive is equipped with a diagnostic status indicator and three push buttons that are used to select displayed information and to edit a limited set of parameter values. Parameters can be scrolled by using ▲▼. To view a value, press ↵. To return back to Scroll mode press ↵.

After pressing ↵ on editable parameters, the yellow status indicator C blinks indicating that the parameter value can be changed. Use ▲▼ to change the value. Press ↵ to store the new setting and return back to Scroll mode.

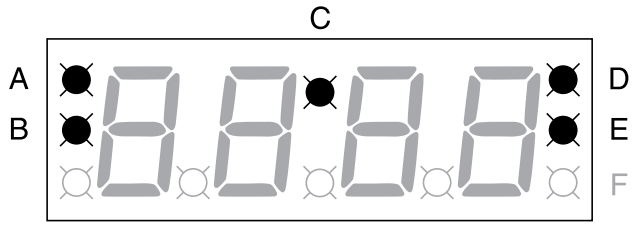
Status Display Information

Status Indicator	Description
StAt	Current drive status - run - drive running, diS - drive disabled, EXX - Drive fault. Where XX is the fault code.
Hx.xx	Hardware revision. For example, H2.00.
Fx.xx	Firmware revision. For example, F2.06.
FLtS	Stored fault's history. You can scroll through stored faults E0XX - E7XX, where XX is the fault code.
Ht	Heatsink temperature. Heatsink temperature in is shown ºC if greater than 40ºC. Otherwise 'LO' (low) is displayed.
EnC	Encoder activity. Primary encoder counts are displayed for encoder diagnostics.
buS	Displays drive DC bus voltage.
Curr	Displays motor's phase current (RMS). Shows current value if drive is enabled, otherwise shows DiS.
boot	0 = autostart disabled, 1 = autostart enabled.
dHCP	Ethernet DHCP Configuration: 0='dHCP' is disabled; 1='dHCP' is enabled.
IP_1	First octet of the IP address.
IP_2	Second octet of the IP address.
IP_3	Third octet of the IP address.
IP_4	Fourth octet of the IP address (changeable).

Status Indicators

The Kinetix 300 drive has five status indicators located around the periphery of the front panel display as shown below. These status indicators used to monitor the system status, activity, and troubleshoot faults.

Front Panel Display



Status Indicators

Status Indicator	Function	Description
A	Enable	Orange status indicator means that the drive is enabled (running).
B	Regen	Yellow status indicator means the drive is in Regeneration mode.
C	Data entry	Yellow status indicator flashes when changing.
D	Drive fault	Red status indicator illuminates upon a drive fault.
E	Comm activity	Green status indicator flashes to indicate communication activity.

Configure the Kinetix 300 Drive Ethernet IP Address

This section offers guidance on configuring your Ethernet connection to the Kinetix 300 drive.

TIP To run MotionView OnBoard on a Mac OS, run the personal computer emulation tool first.

Ethernet Connection

Configuration, programming, and diagnostics of the Kinetix 300 drive are performed over the standard 10/100 Mbps Ethernet communication port using the 'MotionView OnBoard' software contained within the drive itself.

To access the MotionView OnBoard software, the Kinetix 300 drive and your personal computer must be configured to operate on the same Ethernet network. The IP addresses of the Kinetix 300 drive, the personal computer, or both drive and personal computer may require configuring to enable Ethernet communication between the two devices.

IMPORTANT Any changes made to the Ethernet communication settings on the Kinetix 300 drive do not take effect until the drive is powered off and powered on again. Until the power is cycled the drive continues to use its previous settings.

TIP For personal computers with an Ethernet port that is used for a specific purpose, such as email or web browsing, it may be more convenient for you to add an Ethernet port to the personal computer.

Installing a USB/Ethernet dongle or a PCMCIA Ethernet card is an easy way to gain an additional port for communication to the Kinetix 300 drive.

Kinetix 300 Drive Ethernet Port Configuration

The IP address of the Kinetix 300 drive is composed of four sub-octets that are separated by three dots to conform to the Class C Subnet structure. Each sub-octet can be configured with number between 1 and 254. As shipped from the factory the default IP address of a drive is 192.168.124.120.

There are two methods of changing the current IP address. An address can be assigned to the drive automatically (dynamic IP address) when the drive is connected to a DHCP (Dynamic Host Configuration Protocol) enabled server, or the drive can have an IP address assigned to it manually be the user (static IP address). Both methods of configuring the drive's IP address are shown here.

Obtaining the Kinetix 300 Drives' Current Ethernet Settings

The current Ethernet setting and IP address of the Kinetix 300 drive can be obtained from the drive display and keypad. Press ↵ on the display and use ▲▼ to access parameters IP_1, IP_2, IP_3 and IP_4. Each of these parameters contain one sub-octet of the full IP address, for example in the case of the drive default (factory set) address parameters:

IP_1 = 192
IP_2 = 168
IP_3 = 124
IP_4 = 120

By accessing these four parameters the full IP address on the drive can be obtained.

If parameters IP_1, IP_2, IP_3 and IP_4 all contain '----' rather than a numerical values it means that the drive has DHCP enabled and the DHCP server is yet to assign the drive its dynamic IP address. As soon as an IP address is assigned by the server the address assigned is displayed by the drive in the above parameters. See Configuring the IP Address Automatically (dynamic address) on page 87.

Configuring the IP Address Manually (static address)

When connecting directly from the Kinetix 300 drive to the personal computer without a server or when connecting to a private network, where all devices have static IP addresses, assign the IP address of the Kinetix 300 manually.

To assign the address manually, disable the DHCP mode. Do this by using the drive keypad and following these steps.

1. Press ↵.
2. Use ▲▼ to access parameter DHCP.
3. Check this parameter is set to a value of 0.

   If the DHCP parameter is set to 1 then use ↵ and ▼ to set to 0.
4. Cycle power to the drive.

   The change takes effect.

When DHCP is disabled and power cycled to the drive, it reverts back to its previous static IP address.

If you are connecting more than one drive to the personal computer create unique IP address for each drive. Do this by using the keypad on each drive to change the IP_4 parameter. IP_4 is the only octet that can be changed via the keypad. IP_1, IP2, and IP_3 are read-only accessed this way. The dive power must be cycled for any changes to take effect.

To configure the Kinetix 300 drive for specific subnet or change its full IP address, use the MotionView configuration tool.

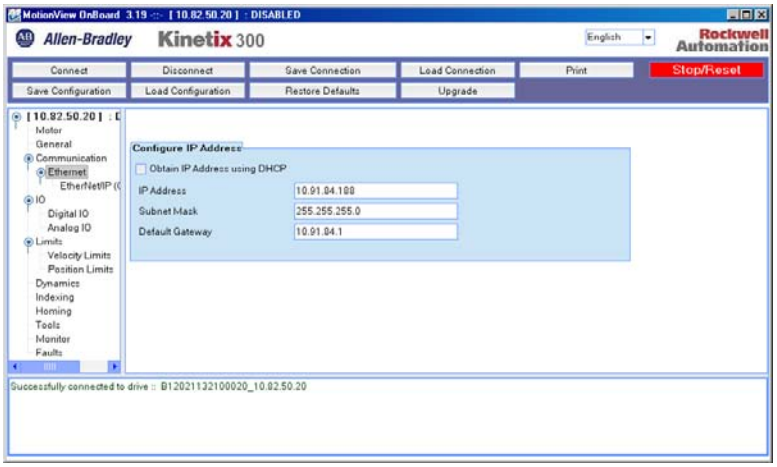
1. Run a Java enabled web browser.
2. Enter the drive's current IP address into the browser.

   MotionView OnBoard dialog box is displayed.

1. Click Run.

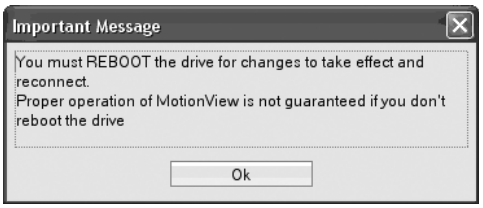
1. Click Connect
2. Enter the drive's IP address
3. Click Connect.
4. From the Drive Oganizer, choose Communications>Ethernet.

   The IP address, subnet mask, and default gateway address can be edited in this screen. If the text turns red when entered the values or format used are invalid and they are not applied.



5. To enable DHCP, click 'Obtain IP Address using DHCP'.
6. To disable DHCP, click DHCP again.
7. Cycle power to make changes to take effect.

The first time you change an Ethernet parameter, the following dialog box appears. Click Ok and cycle power for changes to take effect.


Important Message
You must REBOOT the drive for changes to take effect and reconnect.
Proper operation of MotionView is not guaranteed if you don't reboot the drive
Ok

Configuring the IP Address Automatically (dynamic address)

When connecting a Kinetix 300 drive to a network domain with a DHCP enabled server the IP address of the Kinetix 300 drive is assigned automatically. To have the address assigned automatically the drive must have its DHCP mode enabled. Follow these steps using the drive keypad and display.

1. Press .
2. Use the to access parameter DHCP.
3. Check this parameter is set to 1.
4. If the DHCP parameter is set to 0, use and to set the parameter to 1.
5. Cycle power to the drive to make this change take effect.

When the Kinetix 300 drive is waiting for an IP address to be assigned to it by the server it displays '----' in each of the four octet parameters (IP_1, IP_2, IP_3, and IP_4) on its display. Once the address is assigned by the server it appears in these parameters. If this parameter continues to display '----' then it is likely that a connection between the drive and server has not been established, or the server is not DHCP enabled.

DHCP can be enabled through the MotionView software. If you choose to configure the drive using a manual (static) IP address, you can switch over to an automatic (dynamic) address once configuration is complete. See Obtaining the Kinetix 300 Drives' Current Ethernet Settings on page 85 for information on enabling DHCP from within the MotionView software.

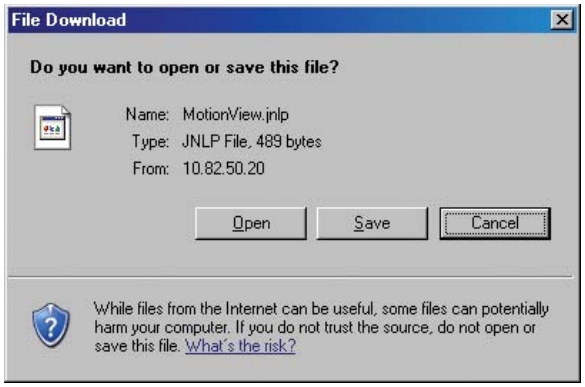
TIP A useful feature of the MotionView software and communication interface to the Kinetix 300 drive is the ability to assign the drive a name (text string). This name can then be used to discover the drive's IP address and is useful when the drive has its IP address assigned automatically by the server for easy connection.

Use the Kinetix 300 MotionView OnBoard Tool

The Kinetix 300 drives contains Kinetix 300 MotionView OnBoard software, in short 'MotionView', for configuration of the drive. Follow these steps to connect to the software.

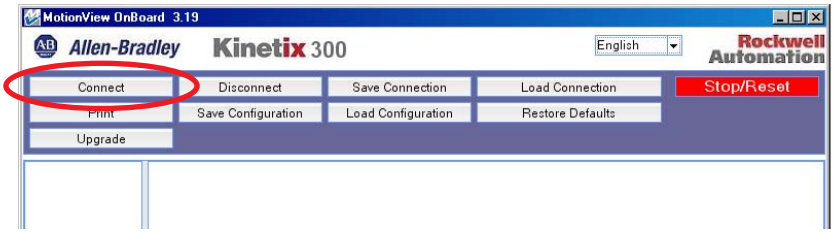
1. Open a Java enabled web browser on the host personal computer.
2. Enter the IP address of the drive into the Address field of the browser.

   A File Download dialog box will prompt you to Open or Save the MotionView.jnlp file.
3. Click Open.


File Download
Do you want to open or save this file?
Name: MotionView.jnlp
Type: JNLP File, 489 bytes
From: 10.82.50.20
Open
Save
Cancel
While files from the Internet can be useful, some files can potentially harm your computer. If you do not trust the source, do not open or save this file. What's the risk?

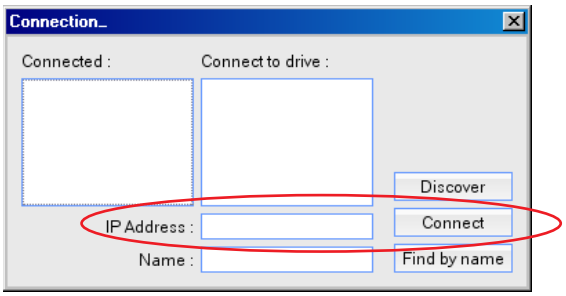
   If the digital signature of the file cannot be verified, Click Run to continue running the application.

   The MotionView dialog box is displayed.
4. Click Connect.



   The Connection dialog box is displayed.

5. Enter the IP address for the drive.



6. Click Connect.

   When connected the drive will appear in the Drive Organizer on the left side of the MotionView dialog box.

Kinetix 300 MotionView OnBoard Menu

Across the top of the MotionView dialog box are control options for working with the drive. A description of their functions is shown in the following table.

MotionView Control Functions

Function	Description
Connect	Connect the MotionView software to one or more drives, multiple drives can be connected to a single instance of MotionView.
Disconnect	Disconnect from the currently selected drive.
Save connection	Save the connection information from the currently connected drives to a file. If multiple drives are connected, connection information for all drives is saved.
Load connection	Load a previously saved connection, if multiple drives were saved then multiple drive connections will be opened.
Print	Print the configuration of the selected drive.
Save configuration	Saves the configuration of the currently selected drive to a file.
Load configuration	Copies the configuration from a file into the selected drive.
Restore defaults	Restore factory defaults to all drive parameters.
Upgrade	Upgrade the firmware in the drive.
Stop/Reset	Disables and resets faults on the currently selected drive.

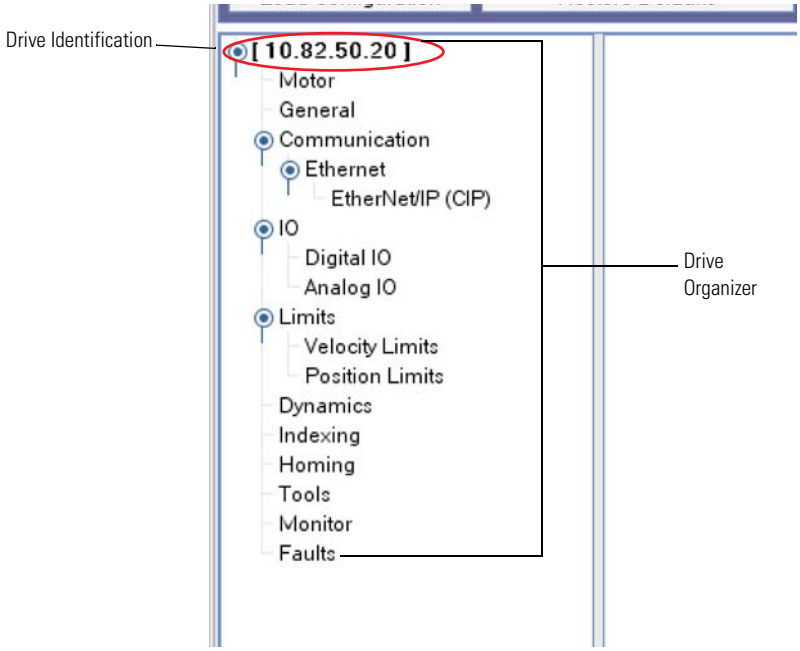
Configuring Drive Using Kinetix 300 MotionView OnBoard Software

On the left side of MotionView software is the Drive Organizer. The Drive Organizer shows node address for the drives that are currently connected to the software and lists the information for each drive under the drive node address. This section contains a description of the parameters displayed in windows listed in the Drive Organizer.

Drive Identification

Drive Identification is labeled with the drive name, IP address, drive name, and status, the window displays drive identification information such as catalog number and firmware revision. In this window you can assign the Drive Name and the Group ID.

Drive Identification and Organizer



Motor

Motor window displays motor information and allows you to change the motor.

- Allen-Bradley motors and actuators with intelligent feedback devices will automatically be populated into the motor configuration.
- For Allen-Bradley motors and actuators with incremental encoders, click Change Motor and choose the device from the provided list.

General

The General window displays basic configuration of motion with modifiable parameters shown in the following table.

General Parameters

Parameter	Description
Current Limits	By default these values are set based on the configured motor, if these values are set lower than the motor capabilities the drive will report CurrentLimitStatus in the EtherNet/IP Input assembly at the new value but will not clamp the current output until it reaches the motor peak current.
Velocity Mode Acceleration	These values only apply if the drive is in a velocity mode over EtherNet/IP External Reference. In Indexing the limits within the individual indexes apply, in a positioning mode over EtherNet/IP External Reference the limits in the Output Assembly apply.
Fault Reset	Configuration of when the drive should clear the current fault.
Motor Temperature Sensor	By default this value will be set based on the configured motor
Master Encoder	Configuration of the Master Gearing functionality

Ethernet Communication

The Ethernet window displays the IP address configuration. Here you can set your drive to obtain the IP address automatically using DHCP or set the values manually.

EtherNet/IP Network (CIP)

The EtherNet/IP (CIP) window displays the modifiable drive object parameters that are used in the Input and Output Assembly EtherNet/IP data links.

EtherNet/IP (CIP) Parameters

Parameter	Description
Enable	Determines if the parameter should be copied into or out of the assembly, even if the data link is disabled empty data will still be transferred over EtherNet/IP network.
Parameter ID Number	The drive object ID number that the data link should map to, see Appendix F for full list of drive parameters.

Digital I/O

IMPORTANT Drive object parameters of type DINT can only be used in the RAM integer data links, parameters of type REAL can only be used in the RAM float data links.

The Digital I/O window displays the configuration of the modifiable digital I/O parameters which are shown in the following table.

Digital I/O Parameters

Parameter	Description
Input Function	Configuration of the specific function for the individual digital inputs, pre-assigned inputs such as Enable and Registration are not configurable.
Output Function	Configuration of the specific function for the individual digital outputs.
Debounce Time	Debounce time in ms of the individual digital inputs.
Hard Limit Switches Action	Configuration of the action to take when the limit switches are asserted.
Enable Switch Function	Configuration of the enable digital input A3 as either: • Run - enable drive when asserted. • Inhibit - must be asserted before the drive can be enabled.
Brake Engage Delay	Configuration of the engage delay of the motor holding brake.
Brake Release Delay	Configuration of the release delay of the motor holding brake.

Analog I/O

The Analog I/O window displays the configuration of the modifiable analog I/O parameters which are shown in the following table.

Analog I/O Parameters

Parameter	Description
Analog Output	Source of the analog output values
Analog Output (Current Scale)	Scaling in V/A of the analog output for output values that are current based.
Analog Output (Velocity Scale)	Scaling in mV/rpm of the analog output for output values that are velocity based.
Analog Input (Current Scale)	Scaling in A/V of the analog input for output values that are current based.
Analog Input (Velocity Scale)	Scaling in rpm/V of the analog input for output values that are velocity based.
Analog Input Dead-Band	The number of mV when the input voltage is below will still be treated as 0V.
Analog Input Offset	The offset from 0V for the analog input, click the << to set the offset to the current value of the analog input.

Velocity Limits

The Velocity Limits window displays the configuration of the modifiable velocity limits parameters which are shown in the following table.

Velocity Limits Parameters

Parameter	Description
Zero Speed	Absolute value in User Units/s below which the drive will set the Zero Speed Digital Output, if configured, and the VelocityStandstillStatus bit in the EtherNet/IP Input Assembly.
At Speed	Value in User Units/s for the target velocity for which the drive will set the In-Speed Window Digital Output, if configured, and the VelocityLockStatus bit in the EtherNet/IP Input Assembly.
Speed Window	The range in User Units/s around the At Speed for setting the In-Speed Window Digital Output, if configured, and the VelocityLockStatus bit in the EtherNet/IP Input Assembly.

Position Limits

The Position Limits window displays the configuration of the modifiable position limits parameters which are shown in the following table.

Position Limits Parameters

Parameter	Description
Position Error	The tolerance in encoder counts around the commanded position outside of which the drive will assert a Excess Position Error Fault when the Max Error Time is exceeded.
Max Error Time	The amount of time in ms that the drive can be outside of the Position Error before the drive asserts a Excess Position Error Fault.
Abort Decel	The deceleration rate in User Units/s^2 that the drive will use to bring the motor to a stop when either the Abort Homing or Abort Index Digital Inputs is asserted, if configured, or either the AbortIndex or AbortHoming bit is set in the EtherNet/IP Output Assembly.
Position Limit	The tolerance in User Units around the commanded position inside of which the drive will set the PositionLockStatus bit in the EtherNet/IP Input Assembly.
Soft Limits	Off or On depending if software travel limits should be used.
Positive Limit and Negative Limit	If Soft Limts are On, the position in User Units when reached the drive will assert a Software Overtravel fault.

Dynamics

The Dynamics window displays the configuration of the modifiable dynamics parameters which are shown in the following table.

Dynamics Parameters

Parameter	Description
Velocity P-Gain	The proportional and integral gain of the velocity loops, gains are based on counts as the fundamental units and they are not physical units.
Velocity I-Gain	
Position P-Gain	The proportional, integral, and derivative gain of the position loops, gains are based on counts as the fundamental units and they are not physical units.
Position I-Gain	
Position D-Gain	
Position I-Limit	A clamping limit on the position loop I-gain compensator to prevent excessive torque overshooting caused by an over accumulation of the I-gain
Gain Scaling	A 2n factor applied to the gains in the velocity loop useful for scaling the gains when using encoders with a high number of counts per revolution such as the MPL-Series motors
Autotuning	Click this button to begin the auto tuning of the drive

Indexing

The Indexing window displays the configuration of the modifiable indexing parameters which are shown in the following table.

Indexing Parameters

Parameter	Description
Index Type	Absolute registration, incremental registration or blended incremental.
Move Type	Trapezoidal or s-curve.
Distance	The incremental distance to move or target position, based on Index Type.
Batch Count	How many times to execute index before moving on to next index.
Dwell	The number ms to remain at position before moving on to next index, it is not applied between batches.
Velocity	The target speed in User Units/s when moving towards new position, axis may not actually reach the target velocity if the acceleration rate is too low.
Acceleration	The rate in User Units/s^2 when accelerating towards velocity.
Deceleration	The rate in User Units/s^2 when deceleration towards zero velocity.
Next Index	The next index to execute after the current index completes.
Action When Complete	Stop, wait for start, or next index.

Homing

The Homing window displays the configuration of the modifiable homing parameters which are shown in the following table.

Homing Parameters

Parameter	Description
Home Accel/Decel	The rates in User Units/s^2 the drive should use in accelerating to or from the homing velocities.
Home Offset	The difference between the zero position for the application and the machine home position found during homing.
Home Velocity Fast (or Slow)	The velocity in User Units/s to be used in homing based on home method.
Home Switch	The digital input that should be used as a home switch for appropriate homing method.
Home Method (1)	A list of action combinations of switch, marker, and immediate for defining the axis home.

(1) Home-to-torque is not available.

Tools

The tools screen provides access to the oscilloscope and parameter viewer drive tools.

Monitor

The monitor screen provides access to pre-configured status information for the drive. This information is displayed in a floating window that updates in real time.

Faults

The Faults window displays the configuration of the modifiable faults parameters which are shown in the following table.

Faults Parameters

Parameter	Description
Last Fault Code	The last fault the drive reported.
Device Time	The time since boot of the drive that the fault occurred.
Load Faults	Recall the last 15 faults the drive reported.
Clear Fault History	Clear the fault history of the drive.
Clear Faults	Clear the current fault in the drive.

Configure the Logix EtherNet/IP Interface Module

This procedure assumes that you have wired your Kinetix 300 drive.

IMPORTANT For the Kinetix 300 drive to communicate with the Ethernet interface module, your RSLogix 5000 software must be version 17.00 or later.

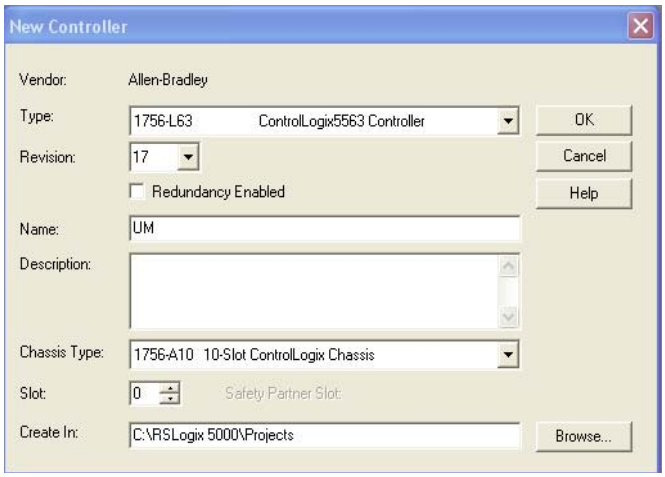
For help using RSLogix 5000 software as it applies to configuring the ControlLogix, CompactLogix, or SoftLogix EtherNet/IP modules, refer to Additional Resources on page 10.

Configure the Logix Controller

Follow these steps to configure the Logix controller.

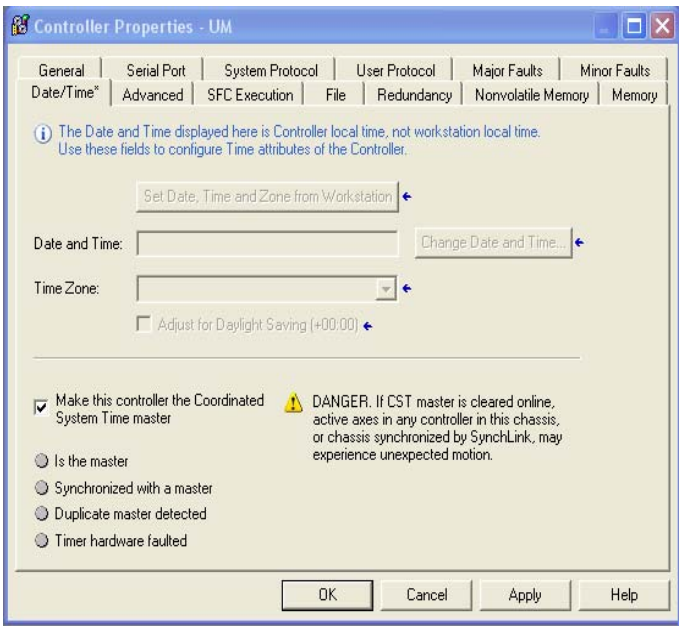
1. Apply power to your Logix chassis containing the Ethernet interface module/PCI card and open your RSLogix 5000 software.
2. From the File menu, choose New.

   The New Controller dialog box opens.



3. Configure the new controller.
   a. Choose controller type.
   b. Choose your RSLogix 5000 software version.
   c. Name the file.
   d. Choose the Logix chassis size.
   e. Enter the Logix processor slot.
4. Click OK.
5. From the Edit menu, choose Controller Properties.

The Controller Properties dialog box opens.



6. Click the Date and Time tab.

7. Check the box Make this controller the Coordinated System Time master.

IMPORTANT You can assign only one ControlLogix controller as the Coordinated System Time master.

8. Click OK.

Configure the Logix Module

Follow these steps to configure the Logix module.

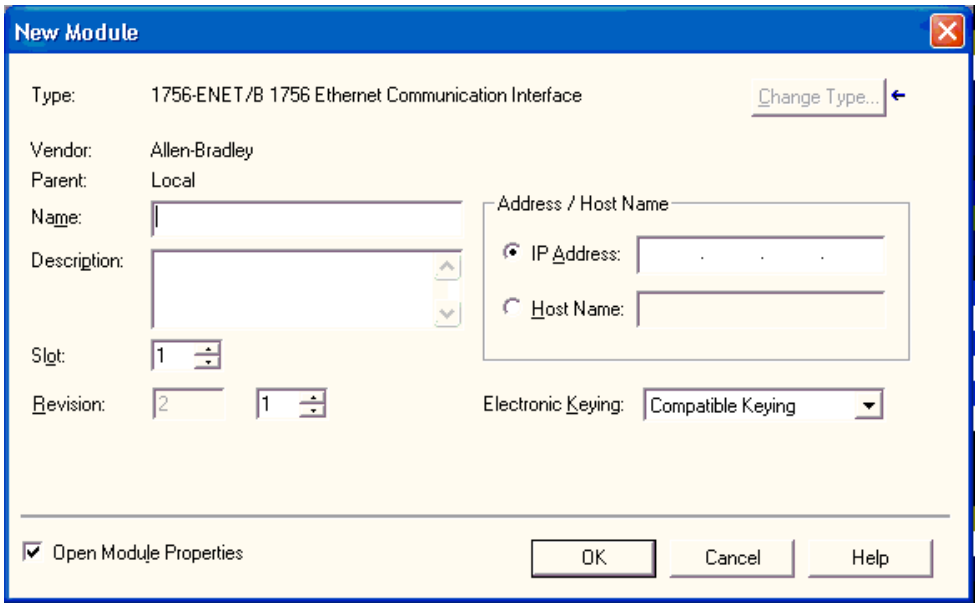
1. Right-click I/O Configuration in the Explorer dialog box and choose New Module.

   The Select Module dialog box opens.

2. Expand the Motion category and select 1769-L3*x*E or 1756-E*xx*/*x* appropriate for your actual hardware configuration.

3. Click OK.

The New Module dialog box opens.



4. Configure the new module.

   a. Name the module.

   b. Enter the IP address of the Ethernet card or Ethernet controller module, not the drive Ethernet address.

   c. Enter the slot where your module resides (leftmost slot = 0).

   d. Choose an Electronic Keying option (select Disable Keying if unsure).

   e. Check the box Open Module Properties.

5. Click OK.

   Your new module appears under the I/O Configuration folder in the Explorer dialog box and the Module Properties dialog box opens.

6. Repeat steps 1…5 for each Logix module.

Configure the Kinetix 300 Drive

Follow these steps to configure the Kinetix 300 drive.

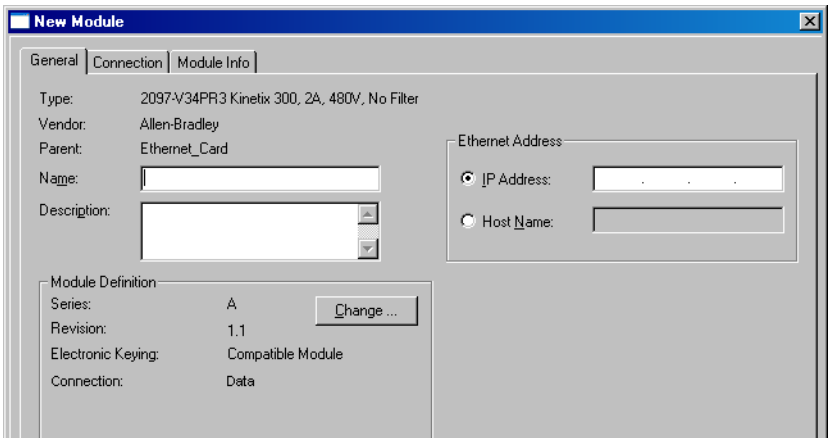
1. Right-click the new Logix module you just created and choose New Module.

   The Select Module dialog box opens.

2. Expand the Drives category and select your Bulletin 2097 drive as appropriate for your actual hardware configuration.

3. Click OK.

   The New Module dialog box opens.



4. Configure the new module.

   a. Name the module.

   b. Set the Ethernet address.

   Set the Ethernet address in the software to match the Ethernet address on the drive. Refer to Obtaining the Kinetix 300 Drives' Current Ethernet Settings on page 85.

Download the Program

After completing the Logix configuration you must download your program to the Logix processor.

Apply Power to the Kinetix 300 Drive

This procedure assumes that you have wired and configured your Kinetix 300 drive system and your Ethernet/IP interface module.

SHOCK HAZARD

To avoid hazard of electrical shock, perform all mounting and wiring of the Bulletin 2097 drive prior to applying power. Once power is applied, connector terminals may have voltage present even when not in use.

Follow these steps to apply power to the Kinetix 300 drive system.

1. Disconnect the load to the motor.

ATTENTION

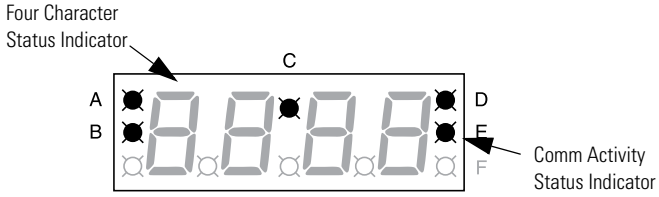
To avoid personal injury or damage to equipment, disconnect the load to the motor. Make sure each motor is free of all linkages when initially applying power to the system.

2. Determine the source of the drive logic power.

If Your Logic Power	Then
Is from (24V DC) back-up power	Apply (24V DC) back-up power to the drive (BP connector).
Mains input power	Apply 195…265V AC (230) or 324…528V AC mains input power to the drive (IPD connector).

3. Apply 195…265V AC (230V) or 324…528V AC (460V) mains input power to the Kinetix 300 drive IPD connector.

4. Observe the four character status indicator.



If the status indicator is	Then
diS	Go to step 5
Blank	Go back to main step 2

5.

If Your Logic Power	Then
Is from (24V DC) back-up power	Apply 195…265V AC (230) or 324…528V AC mains input power to the drive (IPD connector)
Mains input power	Go to step 6

6. Verify that Hardware Enable Input signal IOD connector pin 29 is at 0V.

7. Observe the status indicator on the front of the Kinetix 300 drive.

Status Indicator	Condition	Status	Do This
Drive Fault	Off	Normal condition	Observe the Comm Activity, status indicator E
	Steady red	Drive is faulted	Go to Status Indicators on page 83
Comm Activity	Flashing	Communication is ready	Go to Test and Tune the Axis on page 102
	Off	No communication	Go to Status Indicators on page 83

Test and Tune the Axis

This procedure assumes that you have configured your Kinetix 300 drive, your Logix Ethernet interface module, and applied power to the system.

IMPORTANT Before proceeding with testing and tuning your axis, verify that the Kinetix 300 drive status indicators are operating as described in step 7 on page 102.

Follow these steps to test the axis. This procedure applies only to motors with incremental encoders. When using motors with absolute encoders skip to Tune the Axis.

1. Verify the load was removed from each axis.

2. Run the MotionView OnBoard software.

3. Select Motor.

4. Click Check Phasing at the top of the dialog box.

5. Apply Enable Input signal (IOD-29) for the axis you are testing.

ATTENTION

To avoid personal injury or damage to equipment, apply Enable Input (IOD-29) only to the axis you are testing.

6. Click Start Autophasing.

7. Determine if your test completed successfully.

If	Then
Your test completed successfully and dialog box opens that states motor is phased correctly.	1. Click Ok. 2. Remove Enable Input signal. 3. Go to Tune the Axis on page 103.
Your test did not complete successfully.	1. Click Ok. 2. Verify that the Enable Input signal is applied to the axis you are testing. 3. Verify the motor feedback is wired as required. 4. Return to main step 6 and run the test again.

Tune the Axis

Follow these steps to tune the axes.

1. Verify the load is removed from the axis you want to tune.

ATTENTION

To reduce the possibility of unpredictable motor response tune your motor with the load removed first, then re-attach the load and preform the tuning procedure again to provide an accurate operational response.

2. Run the MotionVeiw OnBoard software.

3. Select General.

4. From the Drive Mode pull-down menu, choose Auto Tune.

5. Select Dynamics.

   The current velocity and position gains, position limit and scaling are displayed.

6. Click Autotuning.

   The Autotuning dialog box opens.

7. Check desired Tuning boxes (Velocity/Position or both).

8. Apply Enable Input signal for the axis you are tuning.

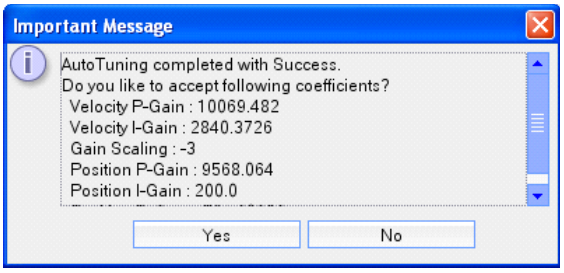
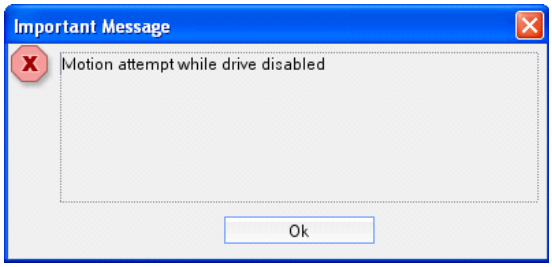
To enable the axis set the DriveEn bit in RSLogix 5000 software for the axis being tuned.

9. Click Start.

The Tune gains dialog box opens.

10. Click Yes.

11. Determine if your test completed successfully.

If	Then
Your test completed successfully, this dialog box opens. 	1. Click Yes. 2. Remove Enable Input signal. 3. Go to step 12.
If your test did not complete successfully, this dialog box opens. 	1. Click Ok. 2. Verify that the Enable Input signal is applied to the axis you are testing. 3. Verify the motor feedback is wired as required. 4. Verify the safe torque-off is wired correctly. 5. Return to main step 6 and run the test again.

12. Select General.

13. From the Drive Mode pull-down menu, choose the mode you desire.

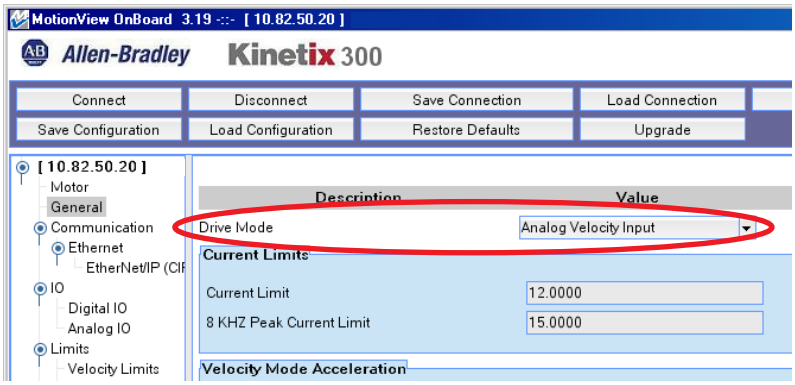
Select Drive Operating Mode

This procedure assumes that you have configured your Kinetix 300 drive, your Logix Ethernet interface module, and applied power to the system.

The drive operating mode determines the command source for the drive, it can be configured from the MotionView software or by Explicit Messaging, instance 266, to the drive object.

Using the MotionView software do the follow to select the operating mode for the drive.

1. Verify the load was removed from each axis.
2. Run the MotionView software.
3. From the Drive Organizer, select General.
4. Select Drive Mode.



Available Drive Modes

Mode	Drive Object Value
Auto Tune	0
EtherNet/IP External Reference	1
Master Gearing	2
Step and Direction	3
Analog Velocity	4
Analog Current	5
Indexing	6

Configure Master Gearing Mode

This procedure assumes that you have configured your Kinetix 300 drive for Master Gearing mode, configured your Logix Ethernet interface module, and applied power to the system.

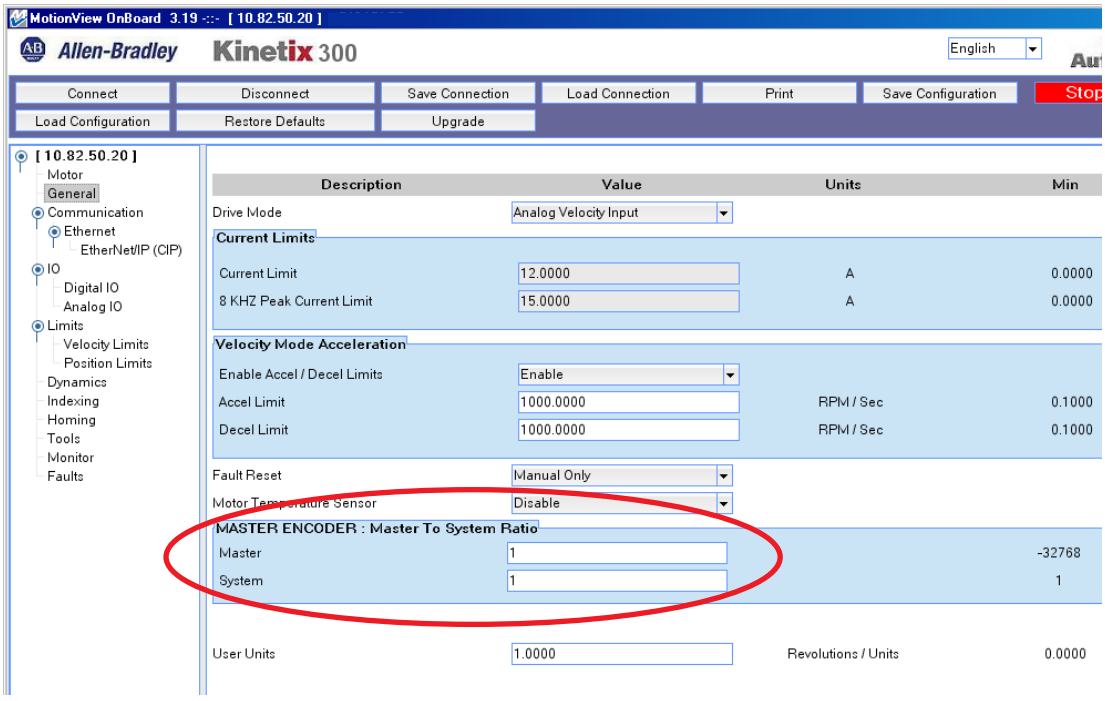
To configure the master gearing ratio follow these steps.

1. Verify the load was removed from each axis.
2. Run the MotionView software.
3. On the Drive Organizer, select General.
4. Determine the buffered encoder output counts per revolution from the master drive.

Bulletin *xxx* Motor	Encoder Type	Resolution
MPL	-H, incremental	2000 lines/rev
TLY		
MPL	-E and -V, sine/cosine	128 lines/rev
	-M and -S, sine/cosine	1024 line/rev

5. Determine the ratio of buffered encoder output counts to the number of system motor counts.
6. Enter the ratio into the Master and System ratio fields.

   Use a negative value in the Master field to reverse the relative direction of the of the drive compared to the master.



When using a Bulletin MPL absolute encoder for Master Gearing the Kinetix 300 planner treats both the 128 and the 1024 pulse encoders as having 262144 interpolated counts per revolution for the purpose of calculating the gearing ratios.

EXAMPLE

A Bulletin MPL multi-turn motor is connected to the master drive and outputs 128 pulses, to achieve a motor rotation ratio of 1:1 the Master value would be 1 and the System value would be (262144/(128 * 4)) or 512.

A Bulletin MPL multi-turn motor is connected to the master drive and outputs 1024 pulses, to achieve a motor rotation ratio of 1:1 the Master value would be 1 and the System value would be (262144/(1024 * 4)) or 64.

IMPORTANT

When the Kinetix 300 master drive is using a multi-turn absolute Allen Bradley TL-Series or Bulletin TLY motor the encoder outputs from the Kinetix 300 drive are not capable of generating pulses at the rated speed of the motor and these motors should not be used on the master drive

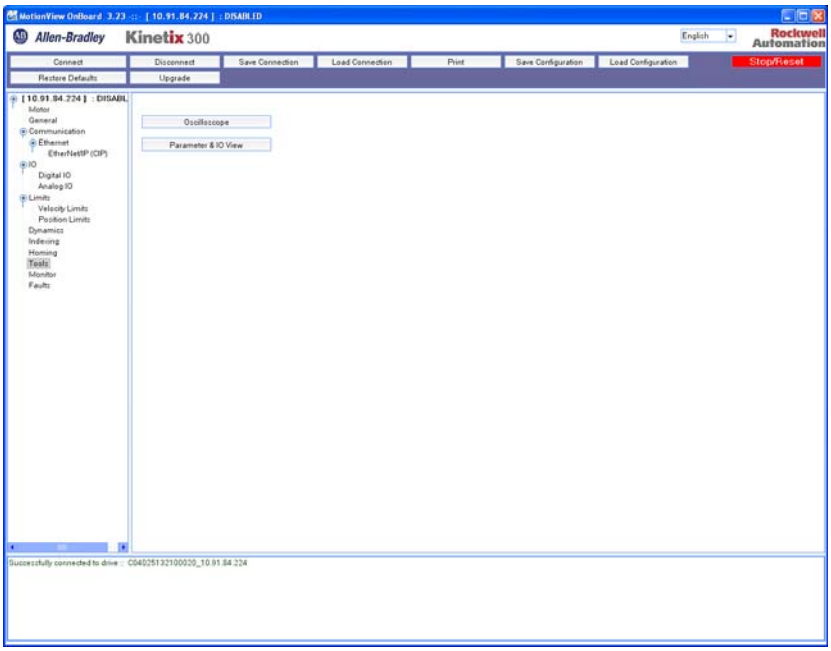
Configure Drive Parameters and System Variables

This section provides information for accessing and changing parameters not accessible through RSLogix 5000 software.

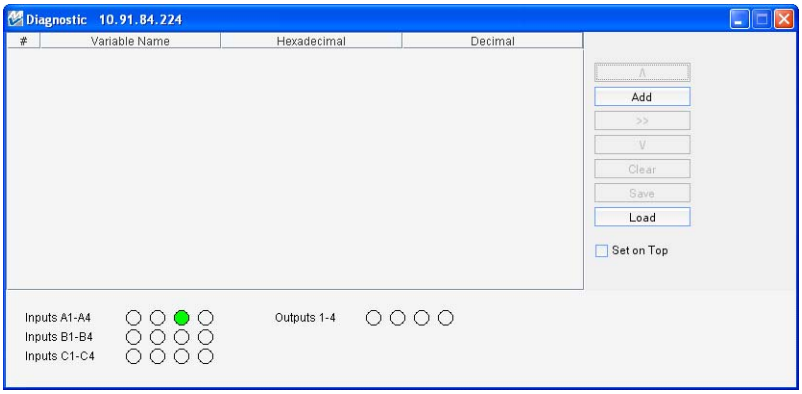
Tools for Viewing Parameters

To view parameters follow these steps.

1. From MotionView software click Tools.



2. Click Parameter>IO View.



3. To add a parameter to the viewer, click Add.

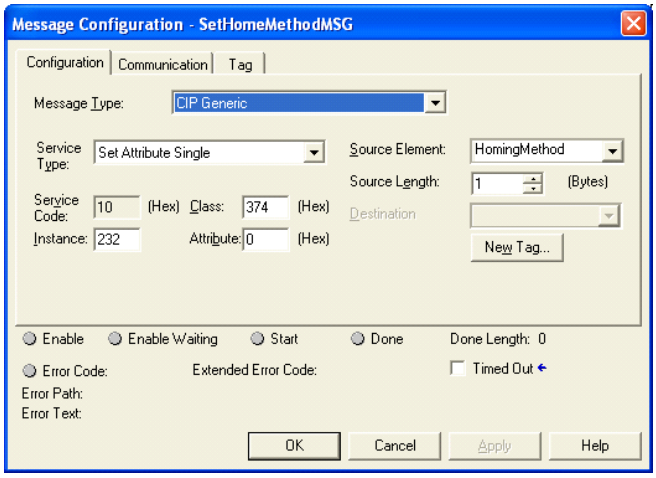
4. Select a parameter from within the tree structure and click Add.

Tools for Changing Parameters

Some parameters are accessible through RSLogix 5000 software. The alternative is to use Explicit Messaging from the Ethernet module.

To change parameters using Explicit Messaging follow these steps.

1. Create a Set Attribute Single MSG instruction in the ladder logic program.



2. Use a Class value of 374 (Hex).

3. Use the ID of the parameter as listed in Appendix F as the Instance.

4. Use the Attribute value to reflect the format of the value and the nonvolatile status of the value.

Attribute	Format	Memory Stored In
0	32-bit integer	Volatile
1	32-bit integer	Nonvolatile
2	32-bit floating point	Volatile
3	32-bit floating point	Nonvolatile
4	String	Volatile
5	String	Nonvolatile

Configuring Drive Mode Using Explicit Messaging

The following Kinetix 300 drive modes can be set via explicit messaging.

- Master Gearing
- Step and Direction
- Analog Velocity
- Analog Current
- Indexing

Set the drive mode by entering the parameters from the appropriate table via EtherNet/IP Explicit Messaging or through the MotionView OnBoard software. For Indexing mode see page 167

Master Gearing

Parameter Name	Tag Number	Description
OperationMode	266	Set to Master Encoder
M2SRatioMaster	79	Master to system ratio Master counts range: -32767…32767
M2SRatioSystem	80	Master to system ratio System counts range: 1…32767
EnableSwitchType	29	Enable switch function 0 = Inhibit only 1 = Enable as soon as asserted

Step and Direction

Parameter Name	Tag Number	Description
OperationMode	266	Set to Step and Direction
M2SRatioMaster	79	Master to system ratio Master counts range: -32767…32767
EnableSwitchType	29	Enable switch function 0 = Inhibit only 1 = Enable as soon as asserted

Analog Velocity

Parameter Name	Tag Number	Description
OperationMode	266	Set to Analog Velocity
VelocityScale	36	Analog input velocity reference scale Velocity = Vinput x VelocityScale Range: -10000…10000 rpm/V
AccelLimit	76	Accel value for Velocity mode Range: 0.1…5000000 UU/s
DecelLimit	77	Decel value for Velocity mode Range: 0.1…5000000 UU/s
EnableVelAccDec	75	Enable Accel/Decel function for Velocity mode 0 = Disable 1 = Enable
AnalogInput1Deadband	89	Analog input dead-band. Applied when used as a velocity reference. Range: 0…100 mV
AnalogInput1Offset	90	Analog input offset. Applied when used as current/velocity reference. Range: -10.000…10.000
AnalogOutFunction	85	Analog output function range: 0…8 0 = Not assigned 1 = Phase current (rms) 2 = Phase current (peak value) 3 = Motor velocity 4 = Phase current R 5 = Phase current S 6 = Phase current T 7 = Iq current 8 = Id current
AnalogOutVelocityScale	86	Analog output scale for velocity quantities Range: 0…10 mV/rpm
EnableSwitchType	29	Enable switch function 0 = Inhibit only 1 = Enable as soon as asserted

Analog Current

Parameter Name	Tag Number	Description
OperationMode	266	Set to Analog Current
CurrentScale	35	Range: -1.2…1.2 A/V
AnalogInput1Deadband	89	Analog input dead-band. Applied when used as a velocity reference. Range: 0…100 mV
AnalogInput1Offset	90	Analog input offset. Applied when used as current/velocity reference. Range: -10.000…10.000
AnalogOutFunction	85	Analog output function Range: 0…8 0 = Not assigned 1 = Phase current (rms) 2 = Phase current (peak value) 3 = Motor velocity 4 = Phase current R 5 = Phase current S 6 = Phase current T 7 = Iq current 8 = Id current
AnalogOutCurrentScale	87	Analog output scale for current related quantities. Range: 0…10V/A
EnableSwitchType	29	Enable switch function 0 = Inhibit only 1 = Enable as soon as asserted

Notes:

Troubleshooting the Kinetix 300 Drive System

Introduction

This chapter provides a description of maintenance and troubleshooting activities for the Kinetix 300 drive.

Topic	Page
Safety Precautions	115
General Troubleshooting	116
Clearing Faults	120

Safety Precautions

Observe the following safety precautions when troubleshooting your Kinetix 300 drive.

ATTENTION

DC bus capacitors may retain hazardous voltages after input power has been removed. Before working on the drive, measure the DC bus voltage to verify it has reached a safe level or wait the full time interval listed on the drive warning label. Failure to observe this precaution could result in severe bodily injury or loss of life.

Do not attempt to defeat or override the drive fault circuits. You must determine the cause of a fault and correct it before you attempt to operate the system. If you do not correct a drive or system malfunction, it could result in personal injury and/or damage to the equipment as a result of uncontrolled machine system operation.

Test equipment (such as an oscilloscope or chart recorder) must be properly grounded. Failure to include an earth ground connection could result in a potentially fatal voltage on the oscilloscope chassis.

General Troubleshooting

Refer to the Error Codes section below to identify anomalies, potential causes, and appropriate actions to resolve the anomalies. If anomalies persist after attempting to troubleshoot the system, contact your Allen-Bradley representative for further assistance. To determine if your Kinetix 300 drive has an error, refer to the table below.

Display Behavior

By default, if there is no activity on the input keypad for 30 seconds, the Kinetix 300 drive continuously scrolls the drives' IP address.

Upon powerup, the display shows its status: diS (disabled) or run (enabled), then after 30 seconds, the drive alternately scrolls the drives' IP address along with its status.

If the Kinetix 300 drive is faulted, the drive displays the fault code (non-scrolling). Then after 30 seconds, the drive alternately scrolls the drives' IP address along with its fault code.

Error Codes

The following list is designed to help you resolve anomalies.

When a fault is detected, the status indicator displays an E and a two-digit error code until the anomaly is cleared.

Error Codes

Error Code	Anomaly	Possible Cause	Action/Solution
–	Status indicator not displaying any messages.	No AC power or backup power.	Verify AC power or backup power is applied to the Kinetix 300 drive.
		Internal power supply malfunction.	Call your Allen-Bradley representative.
–	Motor jumps when first enabled.	Motor wiring error.	Check motor wiring.
		Incorrect motor chosen.	Verify the proper motor is selected.
E04	Motor overtemperature.	Motor thermostat trips due to: • High motor ambient temperature. • Excessive current.	• Operate within (not above) the continuous torque rating for the ambient temperature 40 °C (104 °F) maximum). • Lower ambient temperature, increase motor cooling.
		Motor wiring error.	Check motor wiring.
		Incorrect motor selection.	Verify the proper motor has been selected.

Error Codes (continued)

Error Code	Anomaly	Possible Cause	Action/Solution
E06	Hardware overtravel.	Dedicated overtravel input is inactive.	• Check wiring. • Verify motion profile.
E07	Feedback lost.	The feedback wiring is open, shorted, or missing.	• Check motor encoder wiring. • Ensure that motor is recognized from drive's Web-based configuration motor screen.
E09	Bus undervoltage.	Low AC line/AC power input.	• Verify voltage level of the incoming AC power. • Check AC power source for glitches or line drop. • Install an uninterruptible power supply (UPS) on your AC input.
E10	Bus overvoltage.	Excessive regeneration of power. When the motor is driven by an external mechanical power source, it may regenerate too much peak energy through the Kinetix 300 drive's power supply. The system faults to save itself from an overload.	• Change the deceleration or motion profile. • Use a larger system (motor and Kinetix 300 drive). • Use a resistive shunt. • If a shunt is connected, verify the wiring is correct.
		Excessive AC input voltage.	Verify input is within specifications.
E11	Illegal Hall state.	Incorrect phasing.	Check the Hall phasing.
		Bad connections.	• Verify the Hall wiring. • Verify 5V power supply to the encoder.
E12	Home search failed.	Home sensor and/or marker is outside the overtravel limits.	• Check wiring. • Reposition the overtravel limits or sensor.
E14	Ethernet I/O connection lost.	Ethernet I/O Connection lost.	Check wiring and Ethernet cables and routing. Check controller program to ensure that I/O is scanned at correct RPI rate.
E16	Software overtravel.	Programmed overtravel limit has been exceeded.	• Verify motion profile. • Verify overtravel settings are appropriate.
E17	User-specified current fault.	User-Specified average current level has been exceeded.	Increase to a less restrictive setting.
E18	Overspeed fault.	Motor speed has exceeded 125% of maximum rated speed.	• Check cables for noise. • Check tuning.
E19	Excess position error.	Position error limit was exceeded.	• Increase following error limit or time. • Check position loop tuning.

Error Codes (continued)

Error Code	Anomaly	Possible Cause	Action/Solution
E26	User-specified velocity fault.	User specified velocity level was exceeded.	Increase to a less restrictive setting.
E30	Encoder communication fault.	Communication was not established with an intelligent encoder.	• Verify motor selection. • Verify the motor supports automatic identification. • Verify motor encoder wiring.
E31	Encoder data.	Encoder data is corrupted.	Replace the motor/encoder.
E37	Safe torque-off while enabled.	The safety circuit was opened while drive was enabled or while attempting to enable.	Check safety circuit.
E43	Drive enable input.	An attempt was made to enable the axis through software while the Drive Enable hardware input was inactive.	Disable the Drive Enable Input fault.
		The Drive Enable input transitioned from active to inactive while the axis was enabled.	Verify that Drive Enable hardware input is active whenever the drive is enabled through software.
E44	Controller changed to PROG mode.	Program downloaded or turned key on logix controller to program position.	Place controller back in RUN mode, clear faults.
E67	Operating system failed.	Hardware or configuration failure.	• Cycle power. • Check configuration settings to ensure that drive tags setting are valid.
E70	Memory module error.	Bad memory module	Replace memory module
E72	Drive temperature too high.	Improper airflow/environmental temperature exceeds specifications or an application anomaly.	Check for clogged vents or defective fan. Make sure cooling is not restricted by insufficient space around the unit. Check ambient temperature in enclosure. Reduce acceleration rates. Reduce duty cycle (ON/OFF) of commanded motion. Increase time permitted for motion.

Error Codes (continued)

Error Code	Anomaly	Possible Cause	Action/Solution
E74	Drive has exceeded peak current limit. Drive cannot regulate current properly.	Motor cables shorted.	Verify continuity of motor power cables and connector.
		Motor winding shorted internally.	Disconnect motor power cables form the motor. If the motor is difficult to turn by hand, it may need to be replaced.
		The machine duty cycle requires an RMS current exceeding the continuous rating of the controller.	Change the command profile to reduce speed or increase time.
		Operation above continuous power rating and/or product environmental rating.	Verify ambient temperature is not too high. Operate within the continuous power rating. Reduces acceleration rates.
		The Kinetix 300 drive has a short circuit overcurrent, or failed component.	Remove all power and motor connections and preform a continuity check form the DC bus to the U, V, and W motor outputs. If a continuity exists, check for wire fibers between terminal or send drive in for repair.
E91	User watchdog has timed out.	Ladder program error.	• Not writing to WatchDogKick Tag frequently enough to prevent timeout. • Watchdog timout period set to too low a value. Increase timout period or change controller application to kick watchdog more frequently.
E92	Bad battery.	Tamagawa absolute feedback battery voltage low or missing.	Replace battery.
E93	Motion setup parameters calculate an acceleration value above or below the drive capability.	Check indexing profiles or motion set up profiles.	Increase or decrease acceleration profile. Increase or decrease permitted time for motion.
E94	Motor or motor feedback cable.	Motor or feedback device malfunction.	• Check motor power/feedback wiring. • Replace motor or encoder.
		Recommenced grounding, per installation instructions, has not been followed.	• Verify grounding. • Route feedback cables away from noise sources. • Refer to System Design for Control of Electric Noise Reference Manual, publication GMC-RM001.

Clearing Faults

This section shows you how to clear the faults in the Kinetix 300 drive. There are a two methods to clear faults using digital input or drive parameters.

Clearing Faults Using Digital Inputs

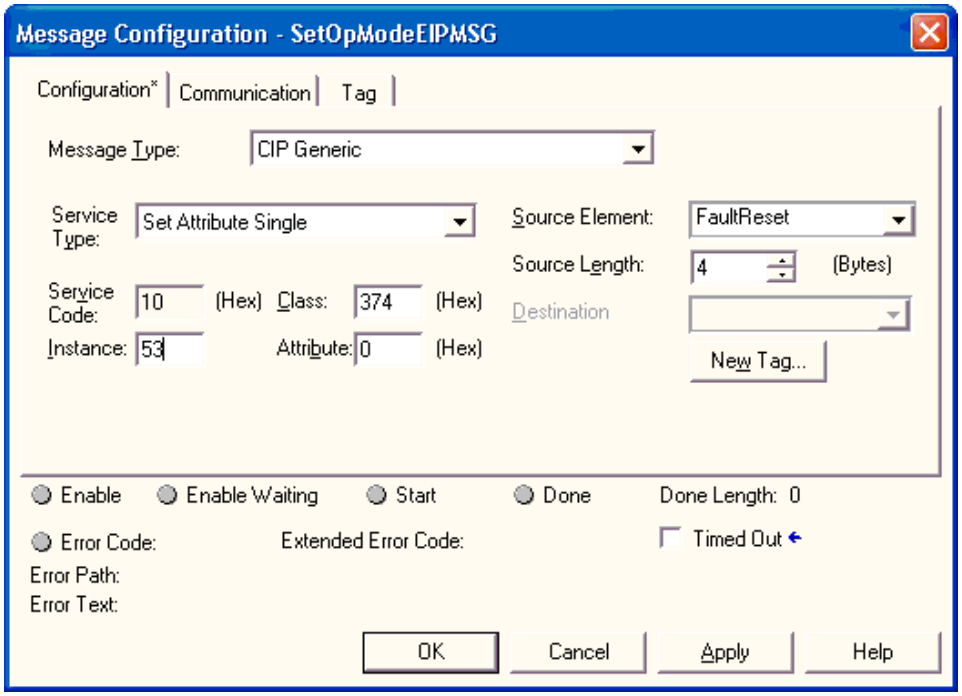
There is a digital input, Fault Reset, on the Kinetix 300 drive that you can configure through the MotionView software. To clear faults using this input make the input active until the fault clears and then deactivate it.

Clearing Faults Using Drive Parameters

You can use the Kinetix 300 drive parameter to reset faults using Explicit Message or UserDefinedData.

Explicit Message

Send Explicit Message from within the RSLogix 5000 software to Class 374 (hex) Instance 53, Attribute 0 to set it to a 1 and then back to a 0 when the fault is cleared.



UserDefinedData

Drive parameter used in the Explicit Message section can be mapped into the integer UserDefinedData by using the MotionView software. Then the parameter can be toggled by using the UserDefinedIntegerData0 or UserDefinedIntegerData1 tags within RSLogix 5000 software.

Drive Enable

The drive clears runtime faults if the drive enable command from RSLogix 5000 software is cycled and the fault reset in the MotionView software is configured for On Disable. For the drive to be enabled the DriveEn bit in the Output Assembly needs to be set to a 1. By changing that from a 1 back to a 0 the fault clears as the drive disables.

Notes:

Specifications and Dimensions

Introduction

This appendix provides product specifications and mounting dimensions for your Kinetix 300 drive system components.

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Kinetix 300 Drive Power Specifications

This section contains power specifications for your Kinetix 300 drive system components.

The 2097-V31PR*x* drives are capable of driving 240V motors at full speed.

Kinetix 300 Drive (single-phase) Power Specifications

Attribute	2097-V31PR0	2097-V31PR2	2097-V32PR0	2097-V32PR2	2097-V32PR4
AC input voltage	120/240V rms single-phase		240V rms single-phase		
AC input frequency	48…62 Hz				
Main AC input current (1) Nom (rms) 120V input Max inrush (0-pk) 120V input Nom (rms) 240V input Max inrush (0-pk) 240V input	 9.7 A 2.3 A 5.0 A 1.1 A	 16.8 A 2.3A 8.6 A 1.1 A	 5.0 A 136 A	 8.6 A 2.3 A	 15.0 A 2.3 A
Integrated AC line filter	No	No	Yes	Yes	Yes
Control power backup input voltage	20…26V DC				
Control power backup input current Nom Max inrush (0-pk)	 500 mA 30 A				
Continuous output current (rms)	2.0 A	4.0 A	2.0 A	4.0 A	8.0 A
Continuous output current (0-pk)	2.8 A	5.7 A	2.8 A	5.7 A	11.3 A
Peak output current (rms) (2)	6.0 A	12.0 A	6.0 A	12.0 A	24.0 A
Peak output current (0-pk)	8.5 A	17.0 A	8.5 A	17.0 A	39.9 A
Continuous power output	0.40 kW	0.80 kW	0.40 kW	0.80 kW	1.70 kW
Shunt On	390V DC		780V DC		
Shunt Off	375V DC		750V DC		
Overvoltage	430V DC		850V DC		
Short circuit current rating	100,000 A (rms) symmetrical				

(1) Kinetix 300 drive modules are limited to 1 AC mains power cycling per minute.

(2) Peak RMS current allowed for up to 2 seconds with a 50% duty cycle.

Kinetix 300 Drive (single-phase and three-phase) Power Specifications

Attribute	2097-V33PR1	2097-V33PR3	2097-V33PR5	2097-V33PR6
AC input voltage	120/240V rms single-phase or three-phase			
AC input frequency	48…62 Hz			
Main AC input current [1] Nom (rms) 120V input Max inrush (0-pk) 120V input Nom (rms) 240V input Max inrush (0-pk) 240V input	 5.0 A 136 A 3.0A 136 A	 8.6 A 2.3 A 5.0A 2.3 A	 15.0 A 2.3 A 8.7A 2.3 A	 24.0 A 11.3 A 13.9 A 11.3 A
Integrated AC line filter	No	No	No	No
Control power backup input voltage	20…26V DC			
Control power backup input current Nom Max inrush (0-pk)	 500 mA 30 A			
Continuous output current (rms)	2.0 A	4.0 A	8.0 A	12.0 A
Continuous output current (0-pk)	2.8 A	5.7 A	11.3 A	17.0 A
Peak output current (rms) [2]	6 A	12 A	24 A	36 A
Peak output current (0-pk)	8.5 A	17.0 A	33.9 A	50.9 A
Continuous power output	0.50 kW	1.00 kW	2.00 kW	3.00 kW
Shunt On	390 V DC			
Shunt Off	375V DC			
Overvoltage	430V DC			
Short circuit current rating	100,000 A (rms) symmetrical			

(1) Kinetix 300 drive modules are limited to 1 AC mains power cycling per minute.

(2) Peak RMS current allowed for up to 2 seconds with a 50% duty cycle.

Kinetix 300 Drive (three-phase) Power Specifications

Attribute	2097-V34PR3	2097-V34PR5	2097-V34PR6
AC input voltage	480V rms three-phase		
AC input frequency	48…62 Hz		
Main AC input current [1] Nom (rms) Max inrush (0-pk)	 2.7A 4.5 A	 5.5 A 4.5 A	 7.9 A 22.6 A
Integrated AC line filter	No	No	No
Control power backup input voltage	20…26V DC		
Control power backup input current Nom Max inrush (0-pk)	 500 mA 30 A		
Continuous output current (rms)	2.0 A	4.0 A	6.0 A
Continuous output current (0-pk)	2.8 A	5.7 A	8.5 A
Peak output current (rms) [2]	6 A	12 A	18 A
Peak output current (0-pk)	8.5 A	17.0 A	25.5 A
Continuous power output	1.00 kW	2.00 kW	3.00 kW
Shunt On	780V DC		
Shunt Off	750V DC		
Overvoltage	850V DC		
Short circuit current rating	100,000 A (rms) symmetrical		

(1) Kinetix 300 drive modules are limited to 1 AC mains power cycling per minute.

(2) Peak RMS current allowed for up to 2 seconds with a 50% duty cycle.

Circuit Breaker/Fuse Specifications

While circuit breakers offer some convenience, there are limitations for their use. Circuit breakers do not handle high current inrush as well as fuses.

Make sure the selected components are properly coordinated and meet acceptable codes including any requirements for branch circuit protection. Evaluation of the short-circuit available current is critical and must be kept below the short-circuit current rating of the circuit breaker.

Use class CC or T fast-acting current-limiting type fuses, 200,000 AIC, preferred. Use Bussman KTK-R, JJN, JJS or equivalent. Thermal-magnetic type breakers preferred. The following fuse examples and Allen-Bradley circuit breakers are recommended for use with Kinetix 300 drives.

Fusing and Circuit Breakers

Cat. No.	Main VAC		
	Bussman Fuse	Allen-Bradley Circuit Breaker (1)	
		Disconnect(2)	Magnetic Contactor(3)
2097-V31PR0	KTK-R-20 (20A)	1492-SP3D300	140M-F8T-C32
2097-V31PR2			
2097-V32PR0			
2097-V32PR2			
2097-V32PR4	LPJ-45SP (45A)	1492-SP3D400	140M-F8E-C45
2097-V33PR1	KTK-R-20 (20A)	1492-SP3D300	140M-D8T-C20
2097-V33PR3			
2097-V33PR5			
2097-V33PR6	KTK-R-30 (30A)	N/A	140U-F8T-C32
2097-V34PR3	KTK-R-20 (20A)	1492-SP3D400	140M-F8T-C32
2097-V34PR5			
2097-V34PR6			

(1) When using Bulletin 1492 circuit protection devices, the maximum short circuit current

(2) Use fully-rated short-circuit protection circuit breaker for device branch circuit protection only

(3) Fully-rated breaker for overload current and short circuit rating.

Contactor Ratings

This table lists the recommended contactor ratings for the Kinetix 300 drive.

Contactor Rating

Kinetix 300 Drive (120/240V) Cat. No.	Contactor
2097-V31PR0	100-C30x10 (AC coil) 100-C30Zx10 (DC coil)
2097-V31PR2	
Kinetix 300 Drive (240V) Cat. No.	
2097-V32PR0	100-C30x10 (AC coil) 100-C30Zx10 (DC coil)
2097-V32PR2	
2097-V32PR4	100-C37x10 (AC coil) 100-C23Zx10 (DC coil)
2097-V33PR1	100-C23x10 (AC coil) 100-C23Zx10 (DC coil)
2097-V33PR3	
2097-V33PR5	
2097-V33PR6	100-C30x10 (AC coil) 100-C30x10 (DC coil)
Kinetix 300 Drive (480V) Cat. No.	
2097-V34PR3	100-C37x10 (AC coil) 100-C23Zx10 (DC coil)
2097-V34PR5	
2097-V34PR6	

Transformer Specifications for Input Power

Attribute	Value (460V system)
Input volt-amperes	750VA
Input voltage	460V AC
Output voltage	120…240V AC

Power Dissipation Specifications

Use the following table to size an enclosure and calculate required ventilation for your Kinetix 300 drive system.

Cat. No.	Power Dissipation, W
2097-V31PR0	28
2097-V31PR2	39
2097-V32PR0	28
2097-V32PR2	39
2097-V32PR4	67
2097-V33PR1	28
2097-V33PR3	39
2097-V33PR5	67
2097-V33PR6	117
2097-V34PR3	39
2097-V34PR5	58
2097-V34PR6	99

General Specifications

This section contains general specifications for your Kinetix 300 drive system components.

Maximum Feedback Cable Lengths

Although Bulletin 2090 motor feedback cables are available in standard lengths up to 90 m (295.3 ft), the maximum feedback cable length for connecting motors or actuators to a Kinetix 300 drive is 20 m (65.6 ft).

Kinetix 300 Drive Weight Specifications

Kinetix 300 Drive Cat. No.	**Value, approx.** kg (lb)
2097-V31PR0	1.3 (2.86)
2097-V31PR2	1.5 (3.31)
2097-V32PR0	1.4 (3.09)
2097-V32PR2	1.7 (3.75)
2097-V32PR4	2.2 (4.85)
2097-V33PR1	1.3 (2.86)
2097-V33PR3	1.5 (3.31)
2097-V33PR5	2.0 (4.41)
2097-V33PR6	1.9 (4.19)
2097-V34PR3	1.5 (3.31)
2097-V34PR5	2.0 (4.41)
2097-V34PR6	1.8 (3.97)

Certifications

Certification [1] (when product is marked)	**Standards**
c-UL-us	UL Listed to U.S. and Canadian safety standards (UL 508 C File E59272).
CE	European Union 2004/108/EC EMC Directive compliant with EN 61800-3:2004: Adjustable Speed Electrical Power Drive Systems - Part 3; EMC Product Standard including specific test methods. European Union 2006/95/EC Low Voltage Directive compliant with: • EN 61800-5-1:2003 - Safety of Machinery - Electrical Equipment of Machines. • EN 50178:1997 - Electronic Equipment for use in Power Installations.
Functional Safety	• EN 60204-1:1997 - Safety of Machinery - Electrical Equipment of Machines. • IEC 61508: Part 1-7:2000 - Functional Safety of Electrical/Electronic/ Programmable Electronic Safety-related Systems. • EN954-1:1996 - Safety of machinery. Safety related parts of control systems. Part 1: General principles for design.
C-Tick	• Radio communications Act: 1992 • Radio communications (Electromagnetic Compatibility) Standard: 1998 • Radio communications (Compliance Labelling - Incidental Emissions) Notice: 1998 • AS/NZS CISPR 11: 2003 (Group 1, Class A)

(1) Refer to http://www.ab.com for Declarations of Conformity Certificates.

Environmental Specifications

Attribute	Operating Range	Storage Range (nonoperating)
Ambient temperature	0…40 °C (32…104 °F)	-10…70 °C (14…158 °F)
Relative humidity	5…95% noncondensing	5…95% noncondensing
Altitude	De-rate by 1% per 300 m (1000 ft) above 1500 m (5000 ft)	3000 m (9843 ft) during transport
Vibration	5…2000 Hz @ 2.5 g peak, 0.015 mm (.0006 in.) max displacement	
Shock	15 g, 11 ms half-sine pulse (3 pulses in each direction of 3 mutually perpendicular directions)	

AC Line Filter Specifications

The tables below contain specifications for AC line filters available for Kinetix 300 servo drive systems.

AC Line Filter Specifications (catalog number 2090-XXLF-TC116)

Attribute	2090-XXLF-TC116
Use with Kinetix 300 Drive Cat. No.	2097-V31PR0 2097-V31PR2
Voltage	250V AC 50/60 Hz
Phase	Single
Current A @ 50 °C (122°F)	16
Power loss W	–
Leakage current mA	87
Weight, approx. kg (lb)	0.80 (1.7)
Humidity	90% relative humidity.
Vibration	10…200 Hz @ 1.8 g vibration.
Operating temperature	-25…100 °C (-13…212 °F)

AC Line Filter Specifications (catalog number 2097-F*x*)

Attribute	2097-F1	2097-F2	2097-F4		2097-F5		2097-F6
Use with Kinetix 300 Drive Cat. No.(1)	2097-V33PR6	2097-V34PR6	2097-V33PR1	2097-V34PR3	2097-V34PR5	2097-V33PR3	2097-V33PR5
Voltage	120/240V AC 50/60 Hz	480V AC 50/60 Hz	120/240V AC 50/60 Hz	480V AC 50/60 Hz		120/240V AC 50/60 Hz	
Phase	One or Three	Three	One or Three	Three		One or Three	
Current A @ 40 °C (104 °F)	24	10	4.4		6.9		15.0
Power loss W	5.2	2.8	1.2		1.3		4.1
Leakage current mA	9	1					
Weight, approx. kg (lb)	0.6 (1.3)		0.8 (1.8)				
Humidity	5…95% noncondensing.						
Vibration	5…2000 Hz @ 2.5 g peak, 0.015 mm (.0006 in.) maximum displacement.						
Operating temperature	0…40 °C (32…104 °F)						

(1) Kinetic 300 drives (catalog numbers 2097-V32PR0, 2097-V32PR2, and 2097-V32PR4) have integrated AC line filters.

Shunt Resistor Specifications

Bulletin 2097 passive shunt resistor wire to the Kinetix 300 drive.

Shunt Resistor Power Specifications

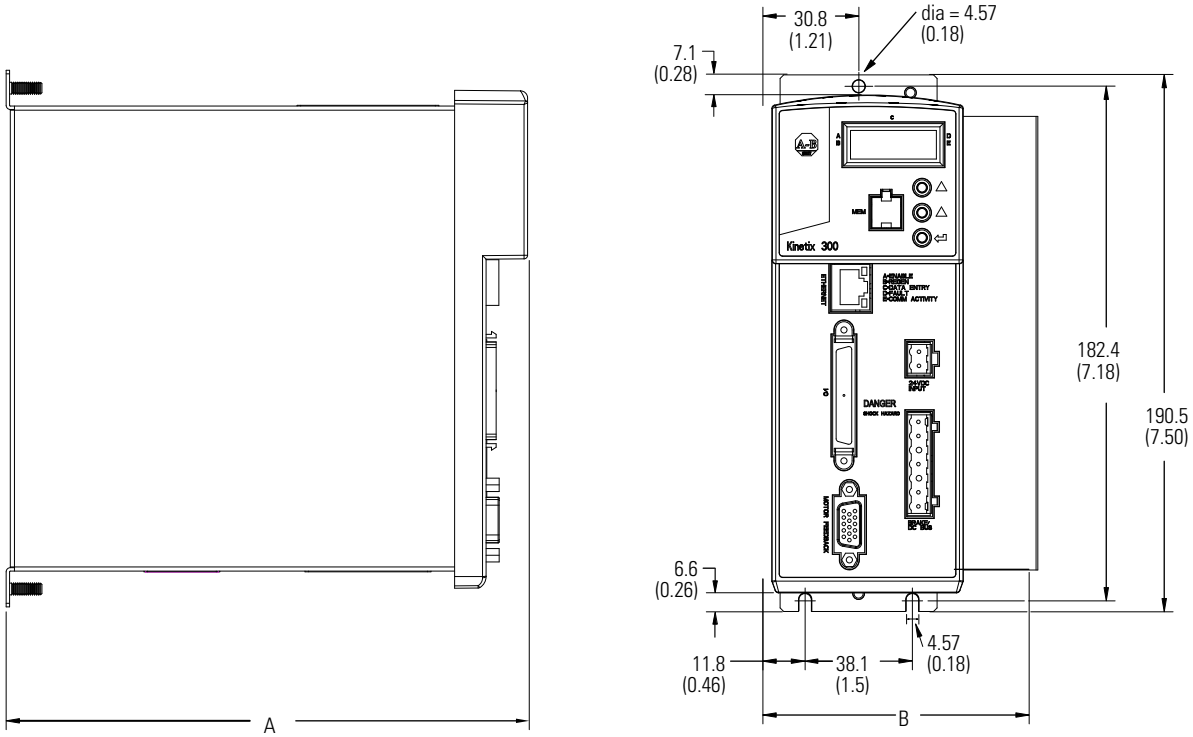
Attribute	2097-R2	2097-R3	2097-R4	2097-R6	2097-R7
Use with Kinetix 300 drive Cat. No.	2097-V32PR4 2097-V33PR5	2097-V33PR6	2097-V31PR0 2097-V31PR2 2097-V32PR0 2097-V32PR2 2097-V33PR1 2097-V33PR3	2097-V34PR5 2097-V34PR6	2097-V34PR3
Resistor value Ω	20	30	40	75	150
Peak power kW	7.6	5.1	3.8	7.9	4.0
Peak current A	19.5	13.0	9.8	10.3	5.1
Continuous power W	150		80	150	80
% RD_Application, max (1)	1.97	2.96	2.10	1.90	2.02
Weight, approx. kg (lb)	0.3 (0.7)		0.2 (0.4)	0.3 (0.7)	0.2 (0.4)

(1) RD_Application is the application duty cycle in percent. For the intermittent regeneration applications use RD_Application = t/T. Where t is the duration when regeneration is needed and T is the time interval between two regenerations. Both t and T must use the same time units such as seconds.

Product Dimensions

This section contains product dimensions for your Kinetix 300 drives.

Dimensions are in mm (in.).



Cat. No.	A mm (in.)	B mm (in.)
2097-V31PR0	185.1 (7.29)	68.0 (2.68)
2097-V31PR2	185.1 (7.29)	68.5 (2.70)
2097-V32PR0	229.6 (9.04)	68.0 (2.68)
2097-V32PR2	229.6 (9.04)	68.5 (2.70)
2097-V32PR4	229.6 (9.04)	86.8 (3.42)
2097-V33PR1	185.1 (7.29)	68.0 (2.68)

Cat. No.	A mm (in.)	B mm (in.)
2097-V33PR3	185.1 (7.29)	68.5 (2.70)
2097-V33PR5	185.1 (7.29)	94.4 (3.72)
2097-V33PR6	229.6 (9.04)	68.0 (2.68)
2097-V34PR3	185.1 (7.29)	68.5 (2.70)
2097-V34PR5	185.1 (7.29)	94.4 (3.72)
2097-V34PR6	229.6 (9.04)	68.0 (2.68)

Interconnect Diagrams

Introduction

This appendix provides wiring examples and system block diagrams for your Kinetix 300 drive system components.

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Wiring Examples

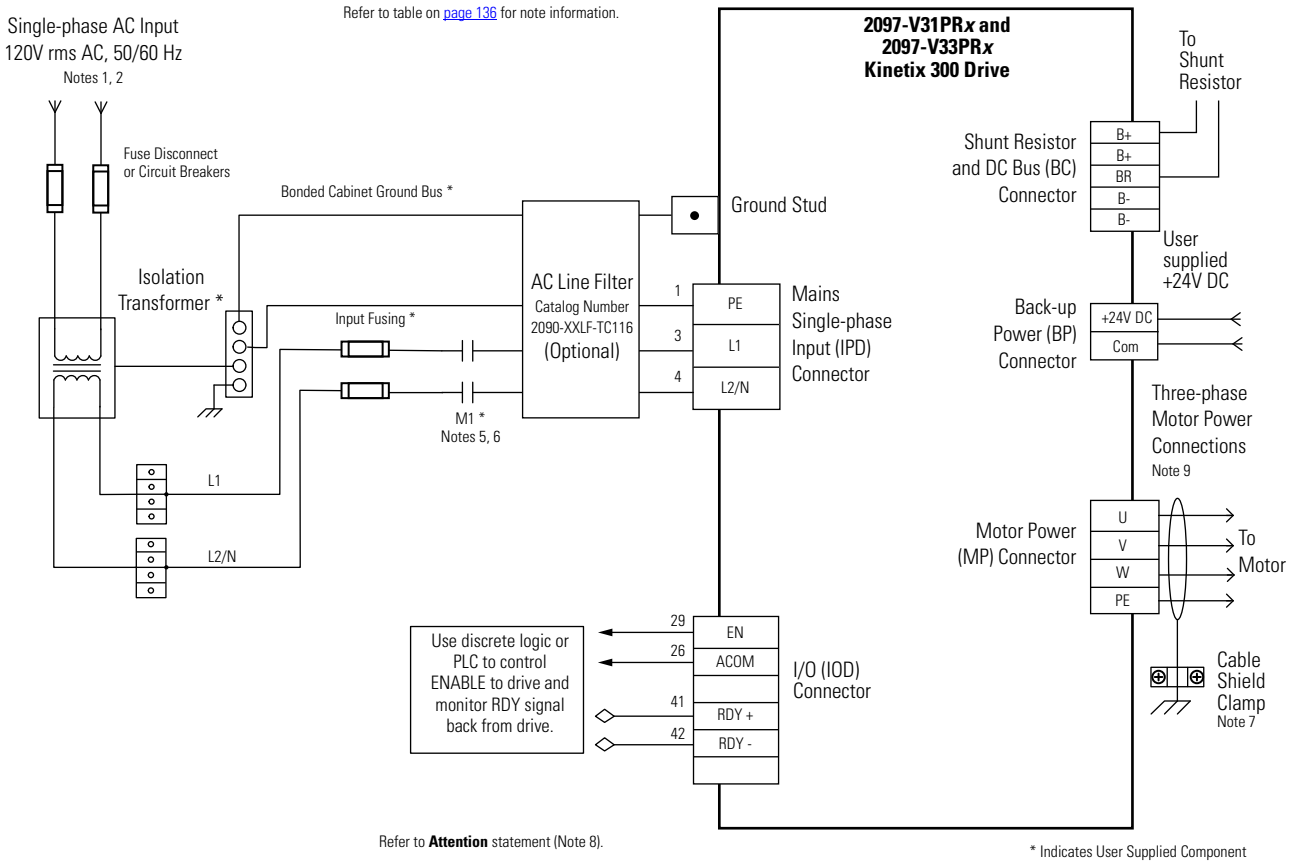
This appendix provides wiring examples to assist you in wiring the Kinetix 300 system. The notes below apply to the wiring examples on the pages that follow.

Note	Information
1	For power wiring specifications, refer to Power Wiring Requirements on page 63.
2	For input fuse and circuit breaker sizes, refer to Circuit Breaker/Fuse Specifications on page 127.
3	Place the AC (EMC) line filters as close to the drive as possible and do not route very dirty wires in the wireway. If routing in wireway is unavoidable, use shielded cable with shields grounded to the drive chassis and filter case. For AC line filter specifications, refer to AC Line Filter Specifications on page 132.
4	Terminal block is required to make connections. Configure one pair from the Digital OUT-1… OUT-4, pins 43…50, as Brake in MotionView software. For Digital Output specifications, refer to page 48.
5	Contactor coil (M1) needs integrated surge suppressors for AC coil operation. Refer to Contactor Ratings on page 128.
6	Drive Enable input must be opened when main power is removed, or a drive fault occurs. A delay of at least 1.0 second must be observed before attempting to enable the drive after main power is restored.
7	Cable shield clamp must be used to meet CE requirements. No external connection to ground is required.
8	**ATTENTION** Implementation of safety circuits and risk assessment is the responsibility of the machine builder. Please reference international standards EN 1050 and EN 954 estimation and safety performance categories. For more information refer to Understanding the Machinery Directive, publication SHB-900.
9	For motor cable specifications, refer to the Kinetix Motion Control Selection Guide, publication GMC-SG001.
10	Motor power cables (2090-XXNPMF-*xx*S*xx* and 2090-CPBM6DF-16AA*xx*) have a drain wire that must be folded back under the cable shield clamp.

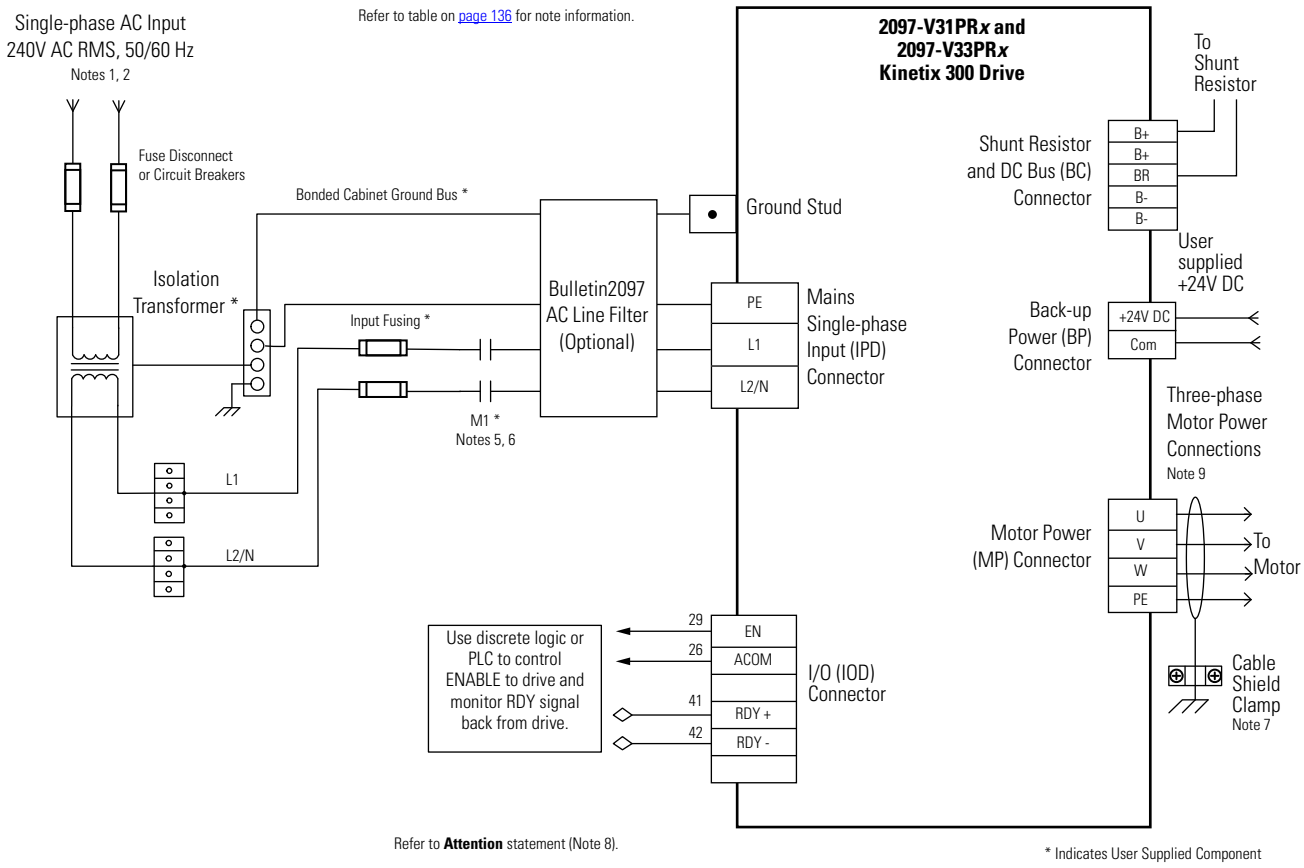
Power Wiring Examples

You must supply input power components. The single-phase and three-phase line filters are wired downstream of fusing and the M1 contactor.

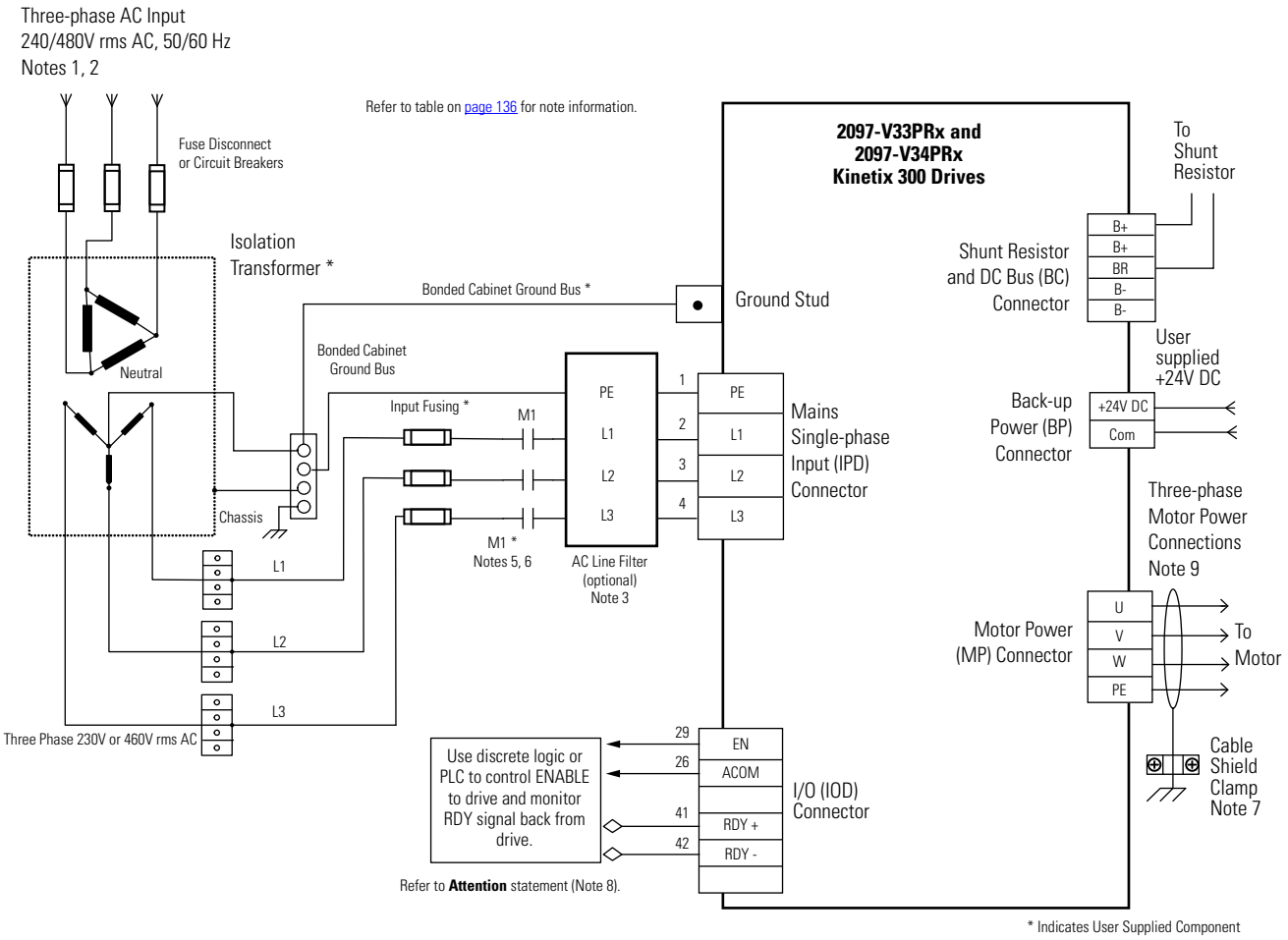
Kinetix 300 Drive Wiring Example (120V single-phase input power)



Kinetix 300 Drive Wiring Example (240V single-phase input power)



Kinetix 300 Drive Wiring Example (240/480V three-phase input power)



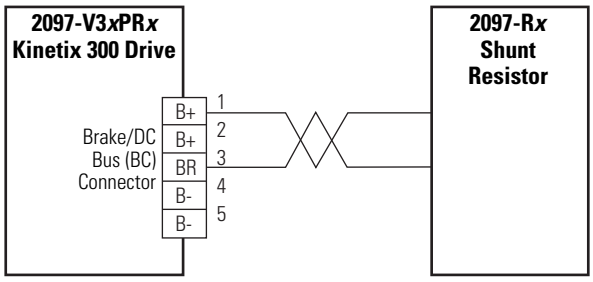
IMPORTANT For the 480V Kinetix 300 drives to meet ISO 13849-1 Safety Category 3 Performance Level d spacing requirements, each phase voltage to ground must be less than or equal to 300V AC rms. This means that the power system must use center grounded wye secondary configuration for 400/480V AC mains.

Shunt Resistor Wiring Example

Refer to the Shunt Resistor Specifications on page 133, for the Bulletin 2097-R*x* shunt resistors that are available for the Kinetix 300 drives.

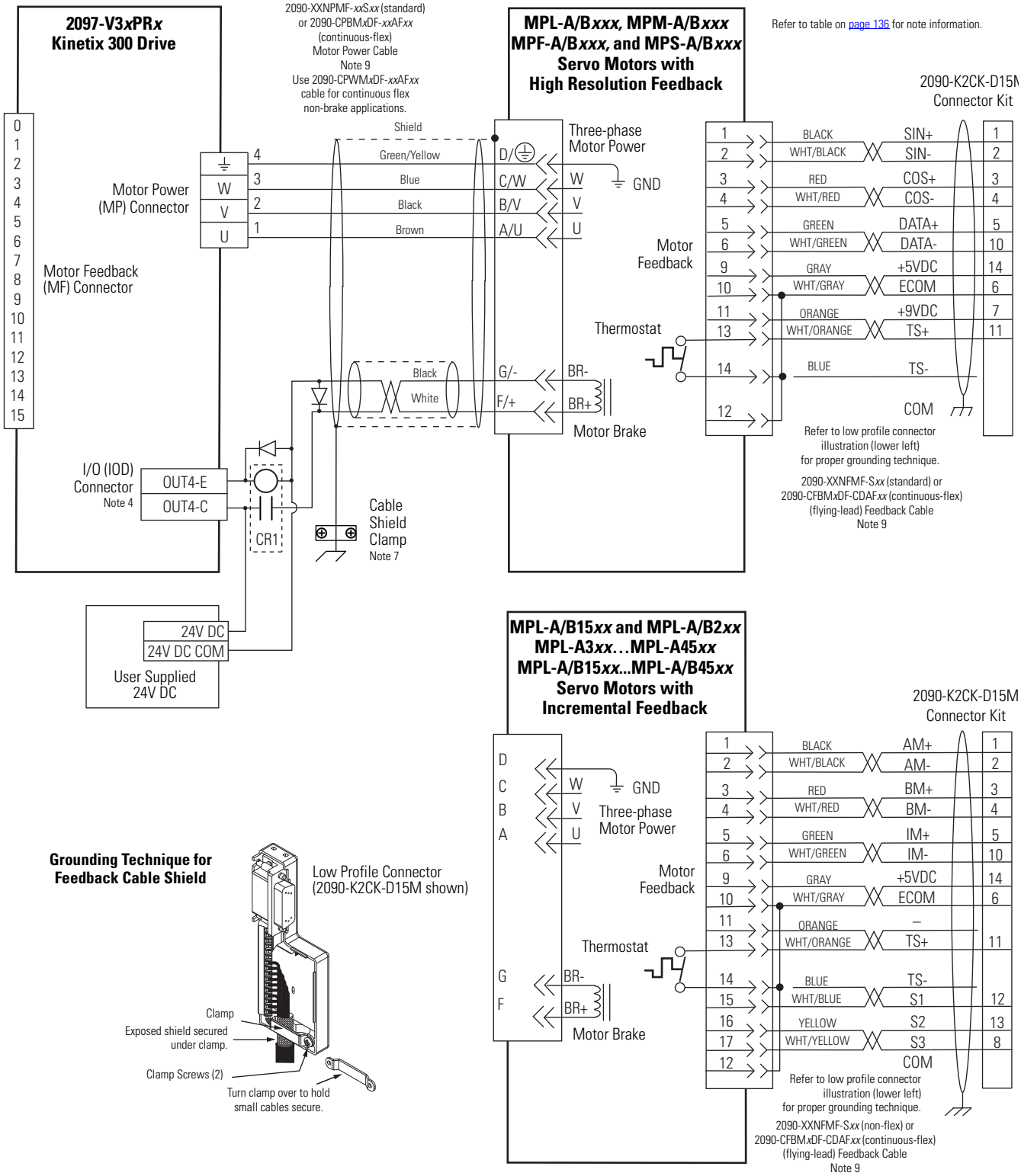
Refer to the Kinetix 300 Shunt Resistor Installation Instructions, publication 2097-IN002, for additional installation information.

Shunt Resistor Wiring Example

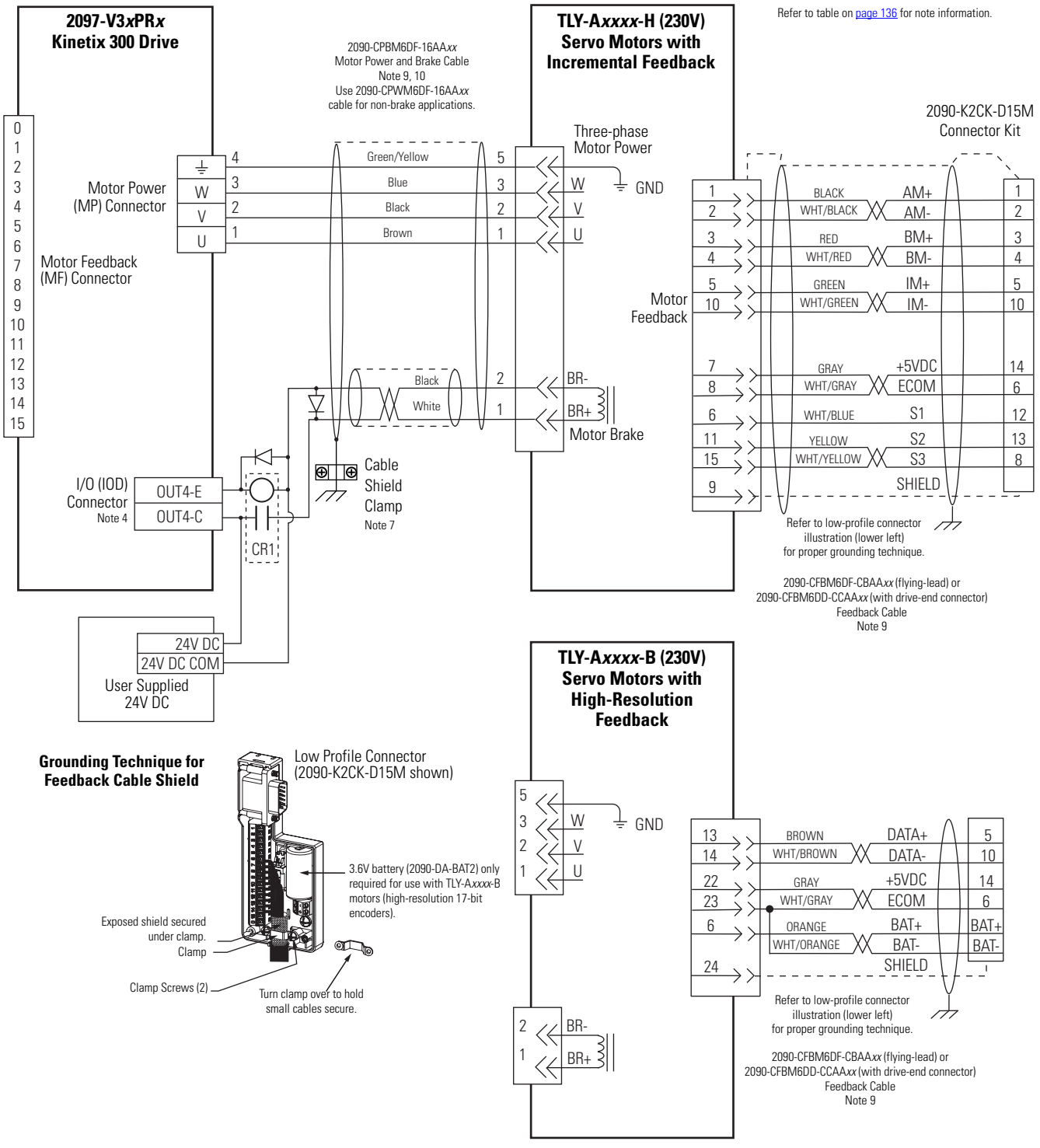


Kinetix 300 Drive/Rotary Motor Wiring Examples

Kinetix 300 Drive Wiring Example with MP-Series (Bulletin MPL-A/B, MPM-A/B, MPF-A/B, and MPS-A/B) Motors



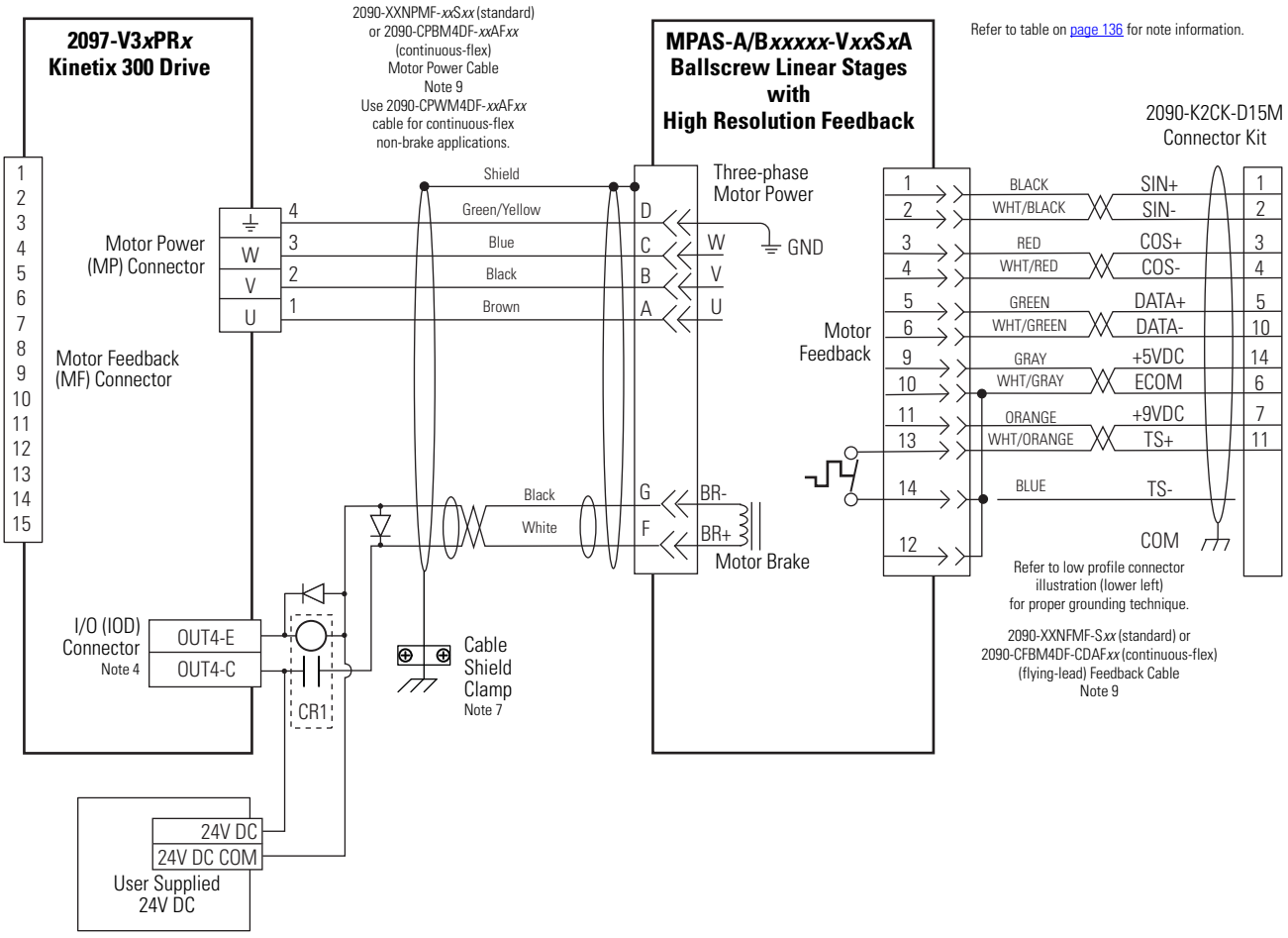
Kinetix 300 Drive (230V) Wiring Example with TL-Series (TLY-A) Motors



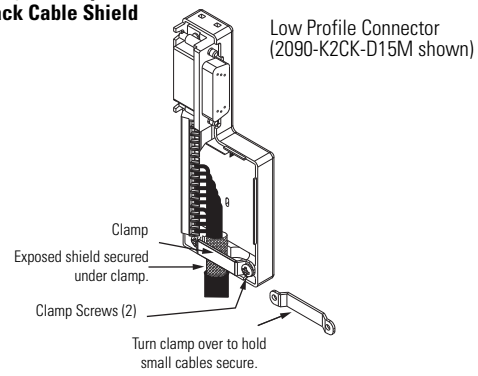
Grounding Technique for Feedback Cable Shield

Kinetix 300 Drive/Actuator Wiring Examples

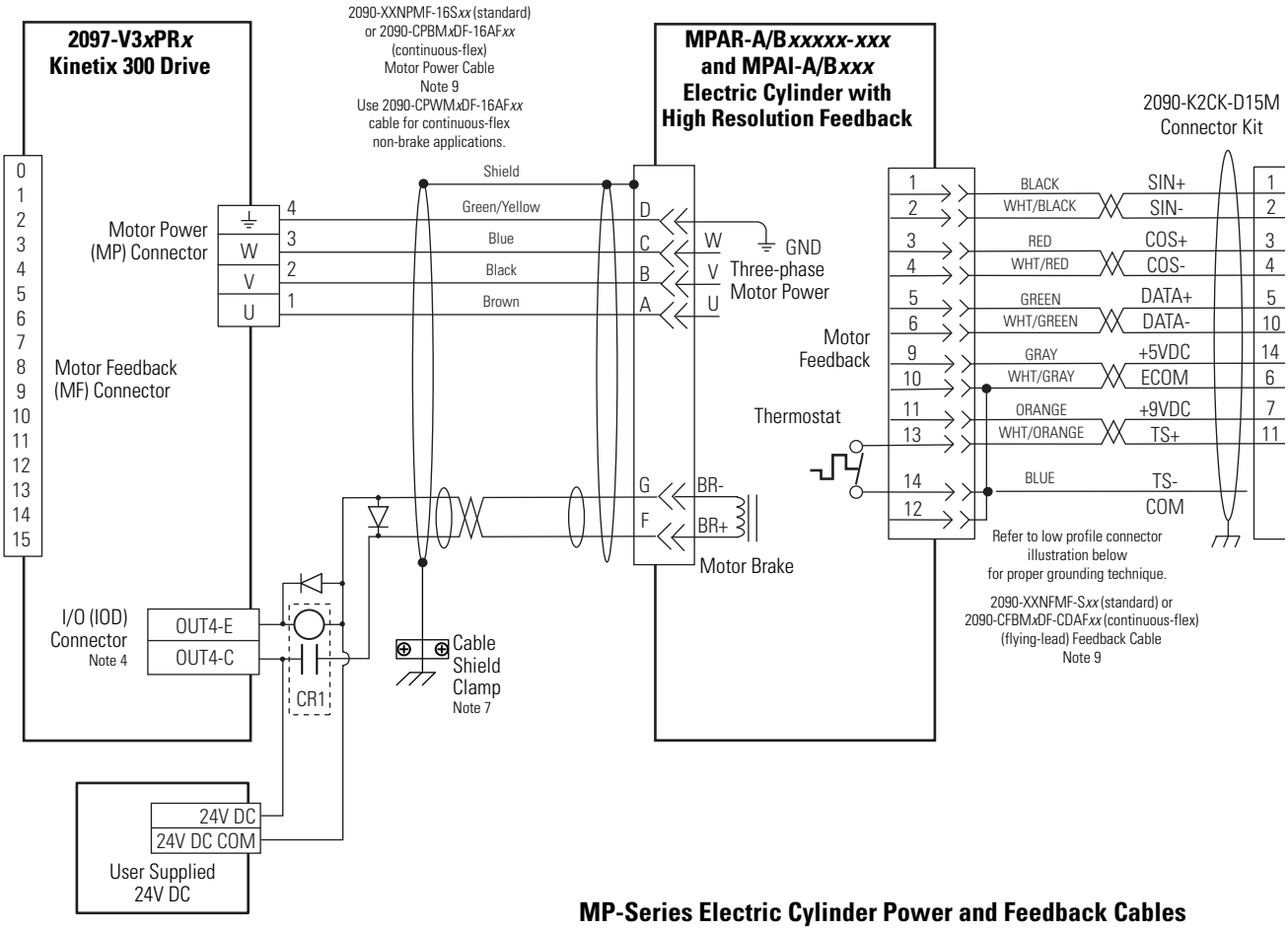
Kinetix 300 Drive (230V) Wiring Example with MP-Series (Bulletin MPAS-A/B) Linear Stages



Grounding Technique for Feedback Cable Shield



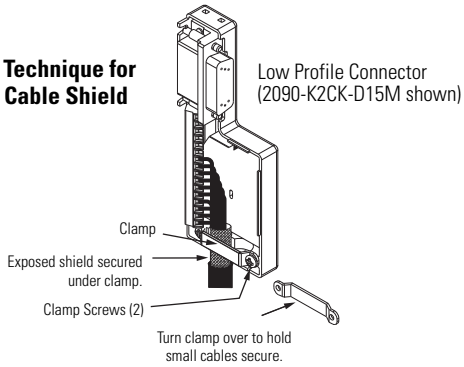
Kinetix 300 Drive Wiring Example with MP-Series Electric Cylinders



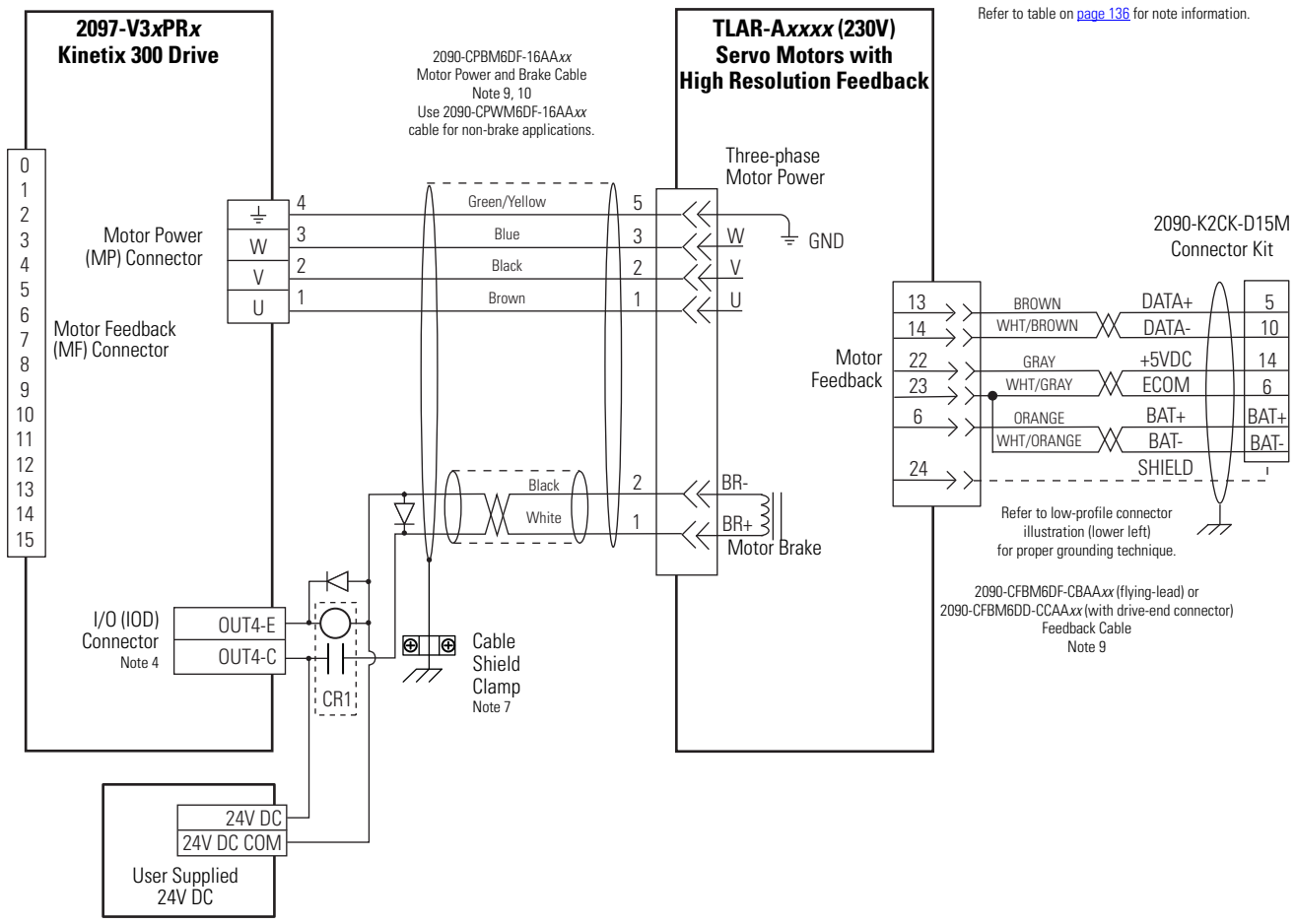
MP-Series Electric Cylinder Power and Feedback Cables

MP-Series Electric Cylinder Cat. No.	Frame	Power Cable Cat. No.	Feedback Cable Cat. No.
MPAR-A/B1*xxx*	32	2090-CP*x*M4DF-16AF*xx*	2090-XXNFMF-S*xx* (standard) 2090-CF*x*M4DF-16AF*xx* (continuous-flex)
MPAR-A/B2*xxx*	40		
MPAR-A/B3*xxx*	63	2090-CP*x*M7DF-16AF*xx*	2090-XXNFMF-S*xx* (standard) 2090-CF*x*M7DF-16AF*xx* (continuous-flex)
MPAI-A/B*xxx*	83		
	110		

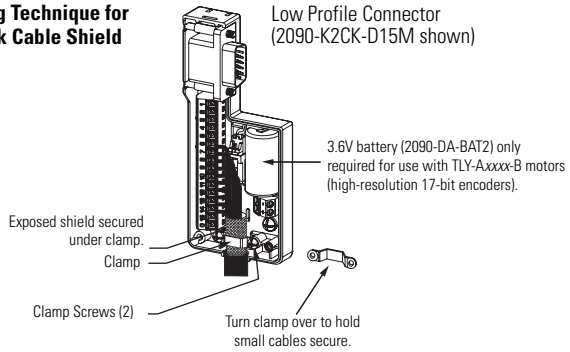
Grounding Technique for Feedback Cable Shield



Kinetix 300 Drive (230V) Wiring Example with TL-Series (TLAR) Electric Cylinders



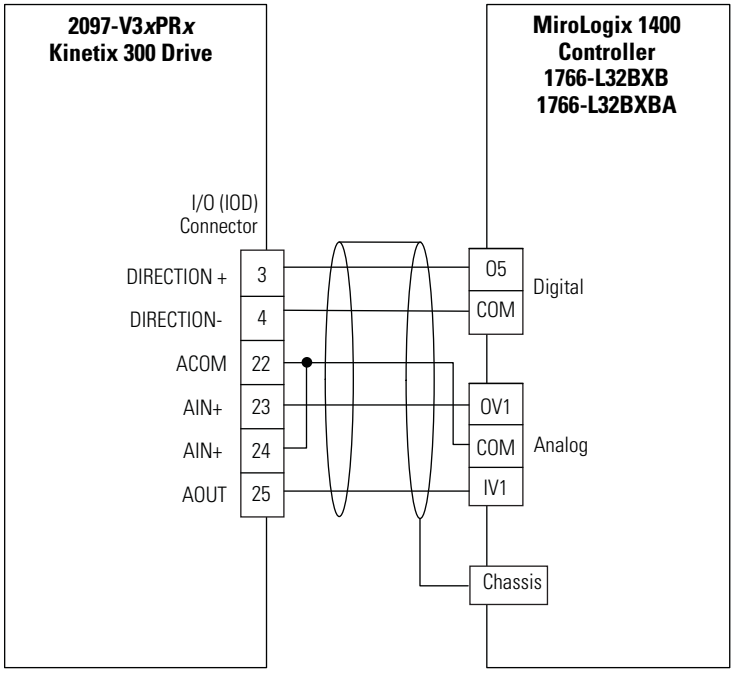
Grounding Technique for Feedback Cable Shield



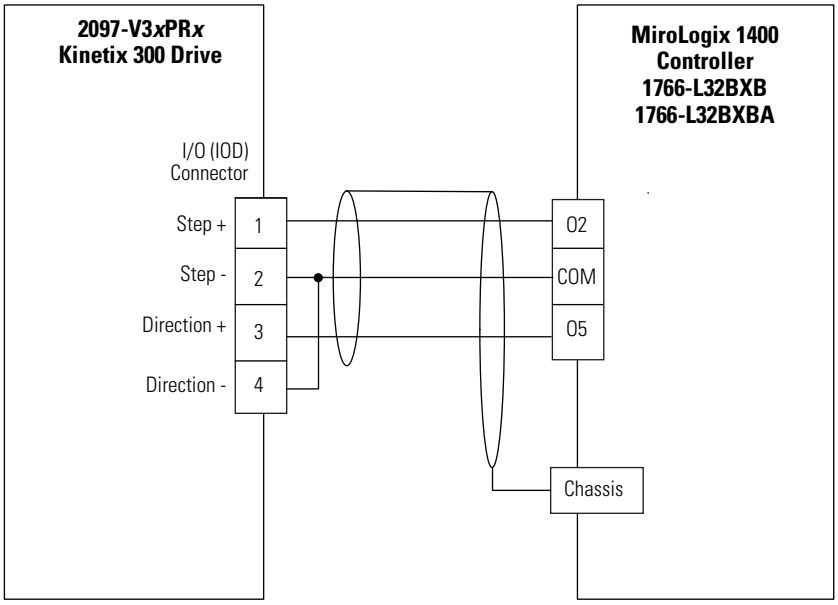
Kinetix 300 Drive/Micrologix Controller Wiring Examples

The Kinetix 300 drive accepts unipolar or bipolar inputs.

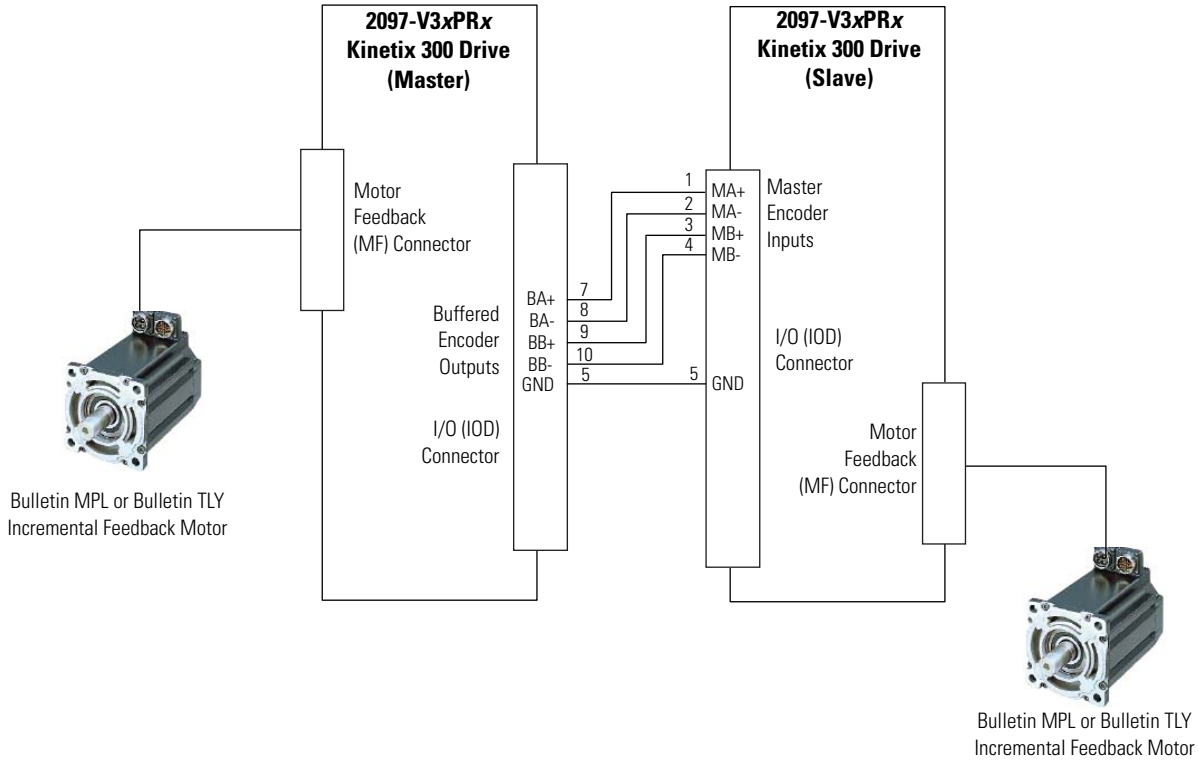
Kinetix 300 Drive Wiring Example to MicroLogix Controller Analog Velocity (or Current) Control Mode



Kinetix 300 Drive Wiring Example to MicroLogix Controller Step and Direction



Kinetix 300 Drive Master Gearing Wiring Example



Motor Brake Currents

The motor brake currents are listed in the following tables. Use these values to size the 24V DC transformer required for your application.

Coil Currents Rated at < 1.0 A

Compatible Brake Motors/Actuators [1]	Coil Current
MPL-*x*1510, MPL-*x*1520, MPL-*x*1530	0.43…0.53 A
MPL-*x*210, MPL-*x*220, MPL-*x*230	0.46…0.56 A
MPL/MPF-*x*310, MPL/MPF-*x*320, MPL/MPF-*x*330	0.45…0.55 A
MPS-*x*330	
MPL-*x*420, MPL-*x*430, MPL-*x*4520, MPL-*x*4530, MPL-*x*4540, MPL-B4560	0.576…0.704 A
MPF-*x*430, MPF-*x*4530, MPF-*x*4540	
MPS-*x*4540	
TLY-A110T, TLY-A120T, and TLY-A130T	0.18…0.22 A
TLY-A220T and TLY-A230T	0.333…0.407 A
TLY-A2530P, TLY-A2540P, and TLY-A310M	0.351…0.429 A

(1) Use of the variable x indicates this specification applies to 230V and 460V motors.

Input and Output Assembly

Introduction

This section describes the input and output assembly used to communicate with RSlogix 5000 software.

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Input and Output Assembly	150

About the Input and Output Assembly

The terms Input and Output refer to the point of view of the scanner device. Output data is produced by the scanner and consumed by the adapter. Input data is produced by the adapter and consumed by the scanner. The Kinetix 300 drive is an adapter device, the controller using RSLogix 5000 software is a scanner device.

The drive contains EtherNet/IP Assembly Object Instances that pertain to the following RSLogix 5000 connection parameters:

- Input (actual values such as actual velocity, actual position)
- Output (enable and reference value going to the drive)
- Index Configuration (see Appendix E on page 167).

Assembly instances are accessible using Class 3 explicit messages as well as the Class 1 I/O messaging.

Kinetix 300 drive parameters are modifiable using Explicit Messaging. The system object to which the Explicit Messages is directed to is described in the following table.

Kinetix 300 Drive Object

Attribute	Value	Comment
Service type	Get Attribute Single	Service code 0x0E (hex)
	Set Attribute Single	Service code 0x10 (hex)
Class	374	Hex
Instance	ID tag from Appendix F	–
Attribute	0	DINT, RAM
	1	DINT, MEM
	2	REAL, RAM
	3	REAL, MEM
	4	String, RAM
	5	String, MEM

When a Kinetix 300 drive parameter is changed using Explicit Messaging, the Set Attribute Single message instruction is directed at this class, the instance is the identifier of the actual parameter and the attribute depends upon the type of data being written.

IMPORTANT If power is removed from the drive data is stored in RAM is lost. Data stored in the memory module remains through power cycles.

IMPORTANT Memory Module writes are limited to 1,000,000 per device. Ensure that all writes targeted at the Memory Module are necessary and not done as part of a background or cyclic task.

Input and Output Assembly

Input Assembly

RSLogix 5000 Field	Description
Fault	A non-zero value in this field means the connection to the drive is not operational and no other fields in the Input Assembly should be used.
DriveEn	A non-zero value in this field means the drive is currently enabled and the servo loops are closed.
PhysicalAxisFault	A non-zero value in this field means the drive has faulted.
PositionLockStatus	A non-zero value in this field means the drive is within the position tolerance window of the commanded position.

Input Assembly (continued)

RSLogix 5000 Field	Description
CurrentLimitStatus	A non-zero value in this field means the drive has reached the current limit. This does not mean the drive is limiting current if the current limit was set to a lower value than the drive or motor supports.
RegistrationEventStatus	A non-zero value in this field means the drive has captured a registration event and position.
IndexingStatus	A non-zero value in this field means the drive is currently operating out of the indexing table within the drive.
MotionComplete	A non-zero value in this field means the drive has completed a position based move.
PositiveOvertravelInput	A non-zero value in this field means the positive overtravel input to the drive has been asserted.
NegativeOvertravelInput	A non-zero value in this field means the negative overtravel input to the drive has been asserted.
HomingStatus	A non-zero value in this field means the drive is currently homing as configured by the Homing section of the MotionView software.
AxisHomedStatus	A non-zero value in this field means the drive has been successfully homed.
VelocityStandstillStatus	A non-zero value in this field means the drive is within the configured tolerance for being at zero velocity.
VelocityLockStatus	A non-zero value in this field means the drive is within the configured tolerance around the commanded velocity.
PowerStructureEn	A non-zero value in this field means the drive power structure is currently enabled and providing current to the motor.
DigitalInputA1Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputA2Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputA3Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputA4Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputB1Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputB2Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputB3Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputB4Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputC1Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputC2Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputC3Status	A non-zero value in this field means this digital input on the drive is currently asserted.
DigitalInputC4Status	A non-zero value in this field means this digital input on the drive is currently asserted.
ActiveIndex	This field indicates the currently executing index from within the indexing table in the drive.
ActualVelocity	This field indicates the current velocity of the motor controlled by the drive.
ActualPosition	This field indicates the current position of the motor controlled by the drive.
PositionCommand	This field indicates the position the drive is moving the motor towards.
PositionError	This field indicates the error between the current command position and the actual position.
MotorCurrent	This field indicates the average RMS current being applied to the motor.
RegistrationPosition	This field indicates the position the motor was at when the registration input was asserted.
UserDefinedIntegerData0	This field is a copy of the current value of whatever parameter it was configured to be in the MotionView software (Data Link).

Input Assembly (continued)

RSLogix 5000 Field	Description
UserDefinedIntegerData1	This field is a copy of the current value of whatever parameter it was configured to be in the MotionView software (Data Link).
UserDefinedIntegerReal0	This field is a copy of the current value of whatever parameter it was configured to be in the MotionView software (Data Link).
UserDefinedIntegerReal1	This field is a copy of the current value of whatever parameter it was configured to be in the MotionView software (Data Link).

Output Assembly

RSLogix 5000 Field	Description
AbortIndex	Upon transition from 0 to 1 of this field the drive aborts the current index or position based move the drive is executing and decel to zero velocity.
StartMotion	Upon transition from 0 to 1 of this field the drive begins moving towards the position in the CommandPosition field below assuming the drive is enabled.
DefineHome	Upon transition from 0 to 1 of this field the drive defines the current position of the motor to be home.
AbortHoming	Upon transition from 0 to 1 of this field the drive aborts (decel to zero velocity) the homing operation.
StartHoming	Upon transition from 0 to 1 of this field the drive begins homing as configured by the Homing section of the MotionView software assuming the drive is enabled.
DriveEn	Upon transition from 0 to 1 of this field the drive enables, it turns on power structure, closes servo loops, tracks commands.
StartingIndex	This field defines the first index the drive should execute if the drive is operating in Indexing mode.
ReferenceSource	This field defines the type of control being exerted over EtherNet/IP network (0 = current, 1 = velocity, 2 = incremental position, 3 = absolute position, 4 = incremental registration, 5 = absolute registration).
AccelerationLimit	This field defines the maximum acceleration the drive uses in accelerating towards the commanded position.
DecelerationLimit	This field defines the maximum deceleration the drive uses in accelerating towards the commanded position.
CommandCurrentOrVelocity	This field defines the commanded current (Amps RMS) or Velocity (User Units/s) if the ReferenceSource is 0 or 1 respectively and the drive is enabled.
VelocityLimit	This field defines the maximum velocity the drive uses in the profile towards the commanded position.
CommandPosition	This field defines the next position command the drive should move the motor towards, takes effect only upon 0 to 1 transition of StartMotion field above.
RegistrationOffset	This field defines the offset from the registration event the drive should move to during an incremental or absolute registration based move.
UserDefinedIntegerData0	The value in this field is written to whatever parameter it was configured to be in the MotionView software (Data Link).

Output Assembly (continued)

RSLogix 5000 Field	Description
UserDefinedIntegerData1	The value in this field is written to whatever parameter it was configured to be in the MotionView software (Data Link).
UserDefinedIntegerReal0	The value in this field is written to whatever parameter it was configured to be in the MotionView software (Data Link).
UserDefinedIntegerReal1	The value in this field is written to whatever parameter it was configured to be in the MotionView software (Data Link).

Notes:

Kinetix 300 Drive Safe Torque Off

Introduction

This appendix introduces you to how the safe torque-off feature meets the requirements for safety category (CAT) 3 performance level d (PLd) applications.

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Understanding the Kinetix 300 Drive Safe Torque-off Feature	157
Description of Operation	158
Safe Torque Off Connector Data	159
Safe Torque Off Circuit Bypass Instructions	160
Wiring Your Kinetix 300 Drive Safe Torque Off Circuit	161
European Union Directives	161
Safe Torque Off Wiring Requirements	162
Kinetix 300 Drive Safe Torque Off Wiring Diagrams	163
Functional Proof Tests	164
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Certification

The safe torque-off circuit is type-approved and certified for use in safety applications up to and including safety category (CAT) 3, according to ISO 13849-1 Safety Category 3 Performance Level d.

The TÜV Rheinland group has approved the Kinetix 300 drives for use in safety-related applications up to ISO 13849-1 Safety Category 3 Performance Level d, in which the de-energized state is considered to be the safe state. All of the examples related to I/O included in this manual are based on achieving de-energization as the safe state for typical machine safety systems.

IMPORTANT

The system user is responsible for:

- validation of any sensors or actuators connected to the drive system.
- completing a machine-level risk assessment.
- certification of the machine to the desired ISO 13849-1 Safety category.
- project management and proof testing.
- programming the application software and the device configurations in accordance with the information in this safety reference manual and the drive product manual.

Safety Category 3 Requirements

Safety-related parts are designed such that:

- a single fault in any of these parts does not lead to the loss of the safety function.
- a single fault is detected whenever reasonably practicable.
- accumulation of undetected faults can lead to the loss of the safety function.

Stop Category Definition

Stop category 0 is achieved with immediate removal of power to the actuator.

IMPORTANT In the event of drive or control failure, the most likely stop category is category 0. When designing the machine application, timing and distance should be considered for a coast to stop. For more information regarding stop categories, refer to EN 60204-1.

Understanding the Kinetix 300 Drive Safe Torque-off Feature

The safe torque-off circuit, when used with suitable safety components, provides protection according to ISO 13849-1 Safety Category 3. The safe torque-off option is just one safety control system. All components in the system must be chosen and applied correctly to achieve the desired level of operator safeguarding.

The safe torque-off circuit is designed to safely remove power from the gate firing circuits of the drive's output power devices (IGBTs). This prevents them from switching in the pattern necessary to generate AC power to the motor.

You can use the safe torque-off circuit in combination with other safety devices to meet the stop and protection-against-restart requirements of ISO 13849-1.

ATTENTION This option is suitable for performing mechanical work on the drive system or affected area of a machine only. It does not provide electrical safety.

SHOCK HAZARD

To avoid an electric shock hazard, verify that the voltage on the bus capacitors has discharged before performing any work on the drive. Be sure the DC bus voltage across the B+ and B- terminals.

SHOCK HAZARD

In Safe Torque-off mode, hazardous voltages may still be present at the motor. To avoid an electric shock hazard, disconnect power to the motor and verify that the voltage is zero before performing any work on the motor.

Description of Operation

The safe torque-off feature provides a method, with sufficiently low probability of failure on demand, to force the power-transistor control signals to a disabled state. When disabled, or any time power is removed from the safety enable inputs, all of the drive's output-power transistors are released from the ON state, effectively removing motive power generated by the drive. This results in a condition where the motor is in a coasting condition (stop category 0). Disabling the power transistor output does not provide mechanical isolation of the electrical output, which may be required for some applications.

Under normal drive operation, the safe torque-off switches are energized. If either of the safety enable inputs are de-energized, the gate control circuit is disabled. To meet ISO 13849-1 safety category 3 both safety channels must be used and monitored.

ATTENTION

Permanent magnet motors may, in the event of two simultaneous faults in the IGBT circuit, result in a rotation of up to 180 electrical degrees.

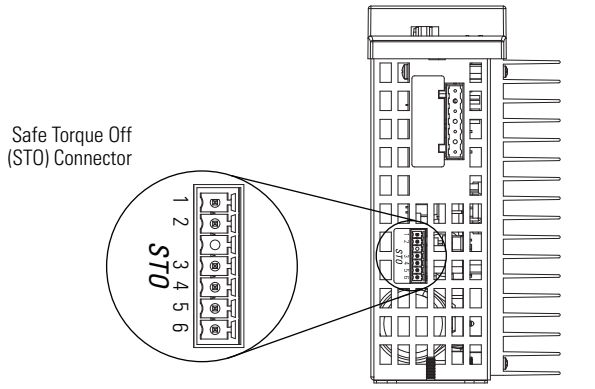
Safe Torque Off Connector Data

This section provides safe torque-off (STO) connector and header information for the Kinetix 300 drive safe torque-off.

STO Connector Pinouts

Headers extend the STO connector signals for use in wiring or to defeat (not use) the safe torque-off function.

6-pin Safe Torque Off (STO) Connector



Kinetix 300 Drive, Bottom View
(2097-V32PR4 is shown)

STO Pin	Description	Signal
1	+24V DC output from the drive	+24V DC control
2	+24V DC output common	Control COM
3	Safety status	Safety Status
4	Safety input 1 (+24V DC to enable)	Safety Input 1
5	Safety common	Safety COM
6	Safety input 2 (+24V DC to enable)	Safety Input 2

Safe Torque Off Circuit Bypass Instructions

Use this section if your application does not require the use of the save torque-off function.

ATTENTION

The drive is supplied from the factory with the safe torque-off circuit enabled. The drive is not operational until +24V is present at terminals STO-4 and STO-6. For the proper safety connections, refer to the Single-axis Relay Configuration (Stop Category 0) diagram on page 163. Under certain applications when safety connections are not required the drive may be operated with the safety circuit disabled. The diagram below illustrates how to bypass the safety circuit.

Follow these steps to bypass the safe torque-off circuit.

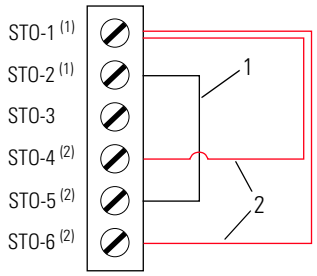
1. Prepare wires as listed.

Quantity	Color	Wire Size mm^2 (AWG)	Length mm (in.)	Strip Length mm (in.)
1	Black	1.5 (16)	51 (2.0)	6 (0.25)
2	Red			

2. Tin striped ends.

3. Wire STO terminal plug as shown.

Item	Description
1	Black wire
2	Red wire



(1) This voltage must under no circumstances be used to supply the safety circuits (terminals STO-3 …STO-6). This voltage is intended only for use in bypassing (disabling) the STO circuits should they not be required.

(2) A Separate +24V DC supply, rated to ISO 13849-1 category 3 must be supplied to STO-4…STO-6 to operate these inputs.

IMPORTANT

Pins STO-1 (+24V DC Control) and STO-2 (Control COM) are used only by the motion-allowed jumpers to defeat the safe torque-off function. When the safe torque-off function is in operation, the 24V supply must come from an external source.

4. Torque all contacts to 0.2 N•m (1.8 lb•in).

5. Install STO terminal plug in STO connector.

Wiring Your Kinetix 300 Drive Safe Torque Off Circuit

This section provides guidelines for wiring your Kinetix 300 safe torque-off drive connections.

European Union Directives

If this product is installed within the European Union or EEC regions and has the CE mark, the following regulations apply.

For more information on the concept of electrical noise reduction, refer to System Design for Control of Electrical Noise Reference Manual, publication GMC-RM001.

EMC Directive

This unit is tested to meet Council Directive 2004/108/EC Electromagnetic Compatibility (EMC) using the following standards, in whole or in part:

- EN 61800-3 - Adjustable Speed Electrical Power Drive Systems, Part 3 - EMC Product Standard including specific test methods
- EN 61000-6-4 EMC - Emission Standard, Part 2 - Industrial Environment
- EN 61000-6-2 EMC - Immunity Standard, Part 2 - Industrial Environment

The product described in this manual is intended for use in an industrial environment.

CE Conformity

Conformity with the Low Voltage Directive and Electromagnetic Compatibility (EMC) Directive is demonstrated using harmonized European Norm (EN) standards published in the Official Journal of the European Communities. The safe torque-off circuit complies with the EN standards when installed according instructions found in this manual.

CE Declarations of Conformity are available online at: www.rockwellautomation.com/products/certification/ce.

Low Voltage Directive

These units are tested to meet Council Directive 2006/95/EC Low Voltage Directive. The EN 60204-1 Safety of Machinery-Electrical Equipment of Machines, Part 1-Specification for General Requirements standard applies in whole or in part. Additionally, the standard EN 50178 Electronic Equipment for use in Power Installations apply in whole or in part.

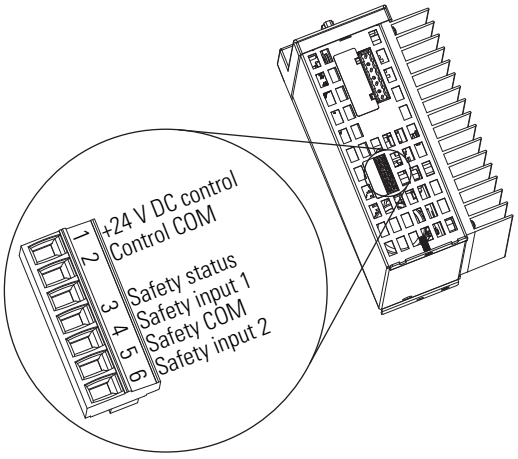
Safe Torque Off Wiring Requirements

These are the safe torque-off (STO) wiring requirements. Wire should be copper with 75 °C (167 °F) minimum rating.

IMPORTANT The National Electrical Code and local electrical codes take precedence over the values and methods provided.

IMPORTANT Stranded wires must terminate with ferrules to prevent short circuits, per table D7 of EN 13849.

Safe Torque Off (STO) Terminal Plug



Safe Torque Off (STO) Terminal Plug Wiring

Safe Torque Off (STO) Connector		Recommended Wire Size		Strip Length mm (in.)	Torque Value N•m (lb•in)
Pin	**Signal**	**Stranded Wire with Ferrule** mm^2 (AWG)	**Solid Wire** mm^2 (AWG)		
STO-1 STO-2 STO-3 STO-4 STO-5 STO-6	+24V DC Control Control COM Safety Status Safety Input 1 Safety COM Safety Input 2	0.75 (18)	1.5 (16)	6 (0.25)	0.2 (1.8)

IMPORTANT Pins STO-1 (+24V DC Control) and STO-2 (Control COM) are used only by the motion-allowed jumpers to defeat the safe torque-off function. When the safe torque-off function is in operation, the 24V supply must come from an external source.

IMPORTANT To be sure of system performance, run wires and cables in the wireways as established in the user manual for your drive.

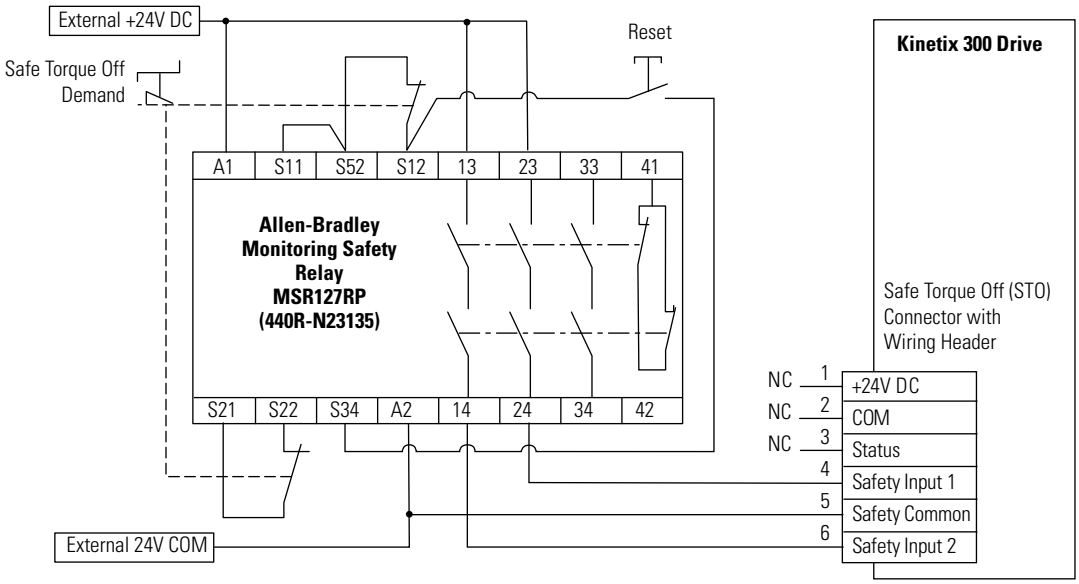
Kinetix 300 Drive Safe Torque Off Wiring Diagrams

This appendix provides typical wiring diagrams for the Kinetix 300 dive safe torque-off feature with other Allen-Bradley safety products.

For additional information regarding Allen-Bradley safety products, including safety relays, light curtain, and gate interlock applications, refer to the Safety Products Catalog, website www.ab.com/catalogs.

In the diagram below, the Kinetix 300 drive safe torque-off connector is shown wired to an Allen-Bradley safety relay.

Single-axis Relay Configuration (Stop Category 0)



Functional Proof Tests

ISO 13849-1 requires that functional proof tests be performed on the equipment used in the system. Proof tests are performed at user-defined intervals, not to exceed one year.

IMPORTANT Users' specific applications determine the time frame for the proof test interval, but it must not exceed one year due to the use of switches internal to the drive, as required by ISO 13849-1.

To proof test the safe torque-off function, you must interrupt power to the inputs of the safe torque-off function at pins STO-4 and STO-6 and verify that the drive is in the disabled state.

Proof Test Truth Table

Safety Function State	Safety Input 1 (STO-4)	Safety Input 2 (STO-6)	Safety Status Output (STO-3)	Drive Status Indication[1]
Normal operation	Energized	Energized	Energized	Run
Safe torque-off mismatch	Energized	De-energized	Energized	E67
	De-energized	Energized	Energized	E67
Safe torque-off function engaged	De-energized	De-energized	De-energized	E67

(1) Drive display changes to condition shown on enable of the drive (IN_ A3 Enable).

Normal operation of the safe torque-off function, if monitored and verified, constitutes the proof test. A safe torque-off mismatch results in error code E67.

Troubleshooting the Safe Torque Off Function

Error Code	Fault Message RSLogix (HIM)	Anomaly	Potential Cause	Possible Resolution
E67	**DriveHardFault** (safe torque-off HW Flt)	Safe torque-off function mismatch. Drive will not allow motion.	• Loose wiring at safe torque-off (STO) connector. • Cable/header not seated properly in safe torque-off (STO) connector. • Safe torque-off circuit missing +24V DC.	• Verify wire terminations, cable/header connections, and +24V. • Reset error and run proof test. • If error persists, return the drive to Rockwell Automation.

ATTENTION The safe torque-off fault (E67) is detected upon demand of the safe torque-off function. After troubleshooting, a proof test must be performed to verify correct operation.

Safe Torque Off Signal Specifications

The following tables provide specifications for the safe torque-off signals used in the Kinetix 300 drives.

Specifications for the ENABLE signals are described in this table.

Safe Torque Off Enable Signal Specifications

Attribute	Value
Safety inputs	Insulated, compatible with single-ended output (+24V DC)
	Enable voltage range: 20…24V DC
	Disable voltage range: 0…1.0V DC
Input impedance	6.8 kΩ
Safety status	Isolated Open Collector (Emitter is grounded.)
Output load capability	100 mA
Digital outputs max voltage	30V DC

Notes:

Configuring Indexing Parameters

Introduction

Use this appendix when setting up the drive to run in Index mode.

Topic	Page
Introduction	167
About Kinetix 300 Drive Indexing	167
Indexing Parameters	168
Explicit Messages for Indexing	173

About Kinetix 300 Drive Indexing

The software for the onboard indexing operation is accessed via a MotionView OnBoard program that is downloaded to any host computer that accesses the IP address of the drive. The indexing operation is also configurable over the EtherNet/IP connection using explicit message in RSLogix 5000 software.

When the Kinetix 300 drive is in Indexing mode the drive performs the required index based position move, for each index, according to the parameters shown in table on page 168. The Kinetix 300 drive supports up to 32 indexes.

The drive validates the index table before execution. During validation, if the drive encounters an error such as index entries that contain invalid values, the drive issues a fault and does not allow execution of the index table until the anomaly has been corrected.

In Indexing mode the Kinetix 300 drive begins executing indexes based on either a command received over the EtherNet/IP connection or immediately upon assertion of the hardware enable signal.

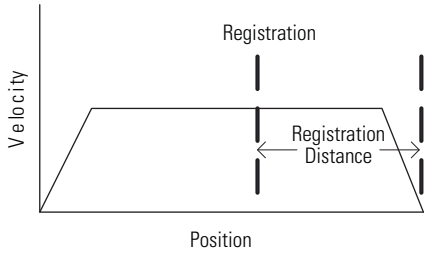
Indexing Parameters

Parameter	Possible Values	Units	Description
Type	Absolute Incremental Registration absolute Registration incremental Blended	—	Selects the indexing type and adjust the input parameters for that type.
Move Type	S-curve Trapezoidal	—	The acceleration and deceleration profile type.
Distance	1…268435.4560	User units	How far to move
Register Distance	1…268435.4560	User units	
Batch Count	1…2147483647	—	How many times to execute index before moving on to next index
Dwell	0…65535	ms	Time to remain at position before moving on to next index.
Velocity	0.0000…10,000,000.0000	User units/s	Speed when moving towards new position.
Acceleration	0.0000…10,000,000.0000	User units/s^2	How quickly to accelerate towards configured velocity.
Deceleration	0.0000…10,000,000.0000	User units/s^2	How quickly to decelerate towards zero velocity from configured velocity.
Next Index	0…31	—	Next index to execute, if any.
Action	Next index Wait for start Next index		What to do when current index is complete.

Registration Distance

If the indexing configuration Type is set to Registration Absolute or Registration Incremental an additional parameter of Registration Distance needs to be configured. In Registration Index mode, the drive moves the motor from its starting position the specified Distance provided that the registration sensor input is not detected. If the registration sensor input is detected, the move is adjusted so that the end position is determined by the Registration Distance setting. Registration Distance is the relative distance the motor travels beyond the position when a registration digital input is detected.

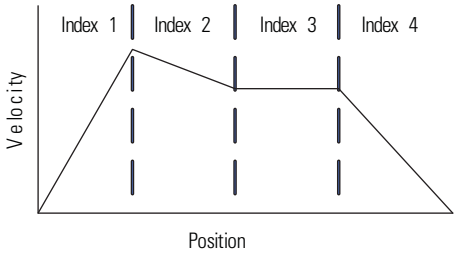
Registration Index Type



Blended

If the indexing configuration Type is set to Blended, the acceleration and deceleration parameters are not programmable, but calculated internally by the drive based upon distance and velocity between the two points of the move. The full profile is assembled by 'stitching' together a sequence of positions and velocities rather than complete move operations. The index table simply contains the position and velocities necessary to assemble the profile.

Example of Blended Indexing



Action Parameter

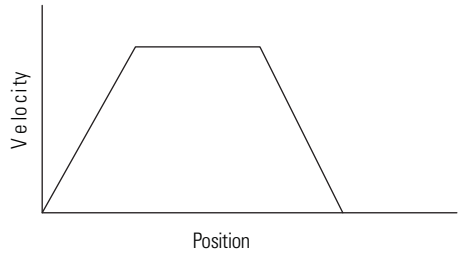
The Action parameter can be set to be one of the following:

- Stop
- Wait for Start
- Next Index

Stop

This action stops and holds zero velocity while remaining enabled. Upon assertion of the Start Index digital input or the Start Motion bit in the EtherNet/IP Output Assembly the Kinetix 300 drive begins executing the index in the Index system parameter.

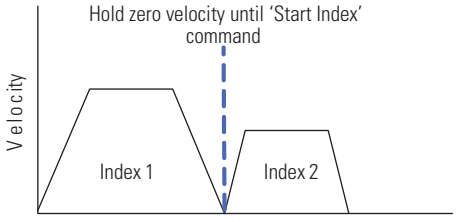
Example of Stop and Hold Index Action



Wait for Start

This action waits for either the Start Motion bit to transition in the EtherNet/IP Output Assembly, or for the Start Index configured digital input to perform an active transition.

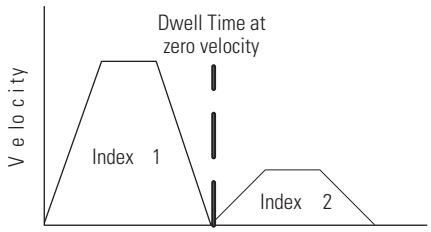
Example of Wait for Start Index Action



Next Index

This action immediately moves to the next index as defined by the Next Index parameter.

Example of Next Index Action



Start Index

During powerup the Kinetix 300 drive is can do one of the following.

- Automatically start the indexing program upon enabling of the drive.
- Waiting for a digital input transition before starting the index.
- Waiting for a software signal over EtherNet/IP network before starting the index.

When the drive is configured for AutoStart Index the drive begins executing the configured index immediately after the drive enables.

If the drive is not configured for AutoStart Indexing the drive does not begin executing the configured index until either the Start Motion bit transitions in the EtherNet/IP Output Assembly or the digital input configured for Start Index is transitioned to an active state.

The configuration for Start Index requires setting the following parameters either over EtherNet/IP Explicit Messaging or through the MotionView OnBoard software interface.

Start Index Configuration

Parameter Name	Description
Drive Mode	Set to [Indexing].
AutoStartIndex	Enable Auto Start index function for Indexing mode when drive becomes enabled: 0 - disable 1 - enable
StartingIndex	The index to start executing.
EnableSwitchType	Enable switch function: 0 - inhibit only 1 - Enable as soon as asserted

Abort Index

An active state terminates an indexing sequence by decelerating to a stop and holding zero velocity while remaining enabled. No further indexing is executed until commanded by the user or controller.

Explicit Messages for Indexing

The Kinetix 300 drive provides an EtherNet/IP assembly for configuring all parameters associated with a a single index from within a single Explicit Message. To do this make a User-Defined type in the RSLogix 5000 program that follows the structure below. Send the User-Defined type in a Set Attribute Single Explicit Message to class 4, instance 115 and attribute 3.

Structure for Indexing User-Defined Type

RSLogix 5000 Field	Description
Index Type	This DINT contains the type of the index, absolute, incremental, registration or blended incremental.
Index Number	This DINT contains the index number that is being modified.
Index Move Type	This DINT contains the move type of the index S-Curve or Trapezoidal.
Index Distance	This REAL contains the move distance of the index.
Index Batch Count	This DINT contains the number of times the index should execute before moving to the next index.
Index Dwell	This DINT contains the number of milliseconds the axis should remain at position before moving to the next index.
Index Velocity	This REAL contains the velocity the axis should move at while moving the specified distance.
Index Maximum Acceleration	This REAL contains the maximum acceleration the axis should use in reaching the index velocity.
Index Maximum Deceleration	This REAL contains the maximum deceleration the axis should use in when approaching the target position.
Index Next Index	This DINT contains the next index the drive should begin executing after completing this index.
Index Action	This DINT contains the action the drive should take once this index is complete.
Index Registration Distance	This REAL contains the displacement from the registration position the axis should move to if a registration index is used.

Notes:

Kinetix 300 Drive Tag Numbers

Introduction

This section lists the Kinetix 300 drive tag ID numbers and their description.

This section lists the Kinetix 300 drive tag ID numbers and their description.

To change these parameters using an Explicit Message configure the message to target class 374, the instance corresponds to the ID in the table below and the attribute is defined by the Kinetix 300 Drive Object attribute table on page 150.

IMPORTANT Memory module writes are limited to 1,000,000 per device. Ensure that all writes targeted at the memory module are necessary and not done as part of a background or cyclic task.

Kinetix 300 Drive Tag Numbers

ID	Data Type	Access	Description
1	String	R	Drive's identification string
2	String	R/W	Drive's symbolic name
3	String	R	Drive's serial number
7	REAL	R	Actual measured motor velocity
9	DINT	R	Drive Fault Register
10	String	R	Motor ID
11	String	R	Motor model
12	String	R	Motor vendor
14	DINT	R	Hallcode index
18	DINT	R	Motor moment of inertia, Jm
19	DINT	R	Motor voltage or back EMF constant, Ke
20	DINT	R	Motor torque or force constant, Kt
21	DINT	R	Motor phase-to-phase inductance, Lm
22	DINT	R	Motor phase-to-phase resistance, Rm
23	DINT	R	Motor's max current(RMS)

Kinetix 300 Drive Tag Numbers (continued)

ID	Data Type	Access	Description
24	DINT	R	Motor's max velocity
25	DINT	R	Motor's poles number
26	REAL	R	Encoder resolution
27	DINT	R	Nominal Motor's terminal voltage
29	DINT	R/W	Enable switch function
30	REAL	R/W	Continuous RMS Current for motor selected.
32	REAL	R/W	Peak current limit for 8kHz operation (based upon motor selected)
35	REAL	R/W	Analog input current reference scale
36	REAL	R/W	Analog input velocity reference scale
39	DINT	R/W	Motor thermal protection function
44	DINT	R/W	Velocity loop Proportional gain
45	DINT	R/W	Velocity loop Integral gain
46	DINT	R/W	Position loop Proportional gain
47	DINT	R/W	Position loop Integral gain
48	DINT	R/W	Position loop Differential gain
49	DINT	R/W	Position loop integral gain limit
51	DINT	R/W	Gains scaling coefficient
53	DINT	R/W	Drive reset
54	DINT	R	Drive's status register
57	DINT	R/W	Network group ID
58	REAL	R/W	Zero Speed window
59	REAL	R/W	At Speed window
60	REAL	R/W	Target Velocity for At Speed window
61	DINT	R/W	Position error
62	REAL	R/W	Position error time (time which position error has to remain to set-off position error fault)
65	DINT	R	Digital inputs states. A1 occupies Bit 0, A2-Bit 1…C4-Bit 11.
66	DINT	R/W	Digital outputs states.
67	DINT	R/W	Ethernet IP address. IP address changes at next boot up. 32 bit value
68	DINT	R/W	Ethernet IP NetMask. Mask changes at next boot up. 32 bit value
69	DINT	R/W	Ethernet Gateway IP address. Address changes at next boot up. 32 bit value
70	DINT	R/W	Use DHCP
71	REAL	R	Analog Input AIN1 current value
73	REAL	R	Measured Bus voltage
74	REAL	R	Heatsink temperature

Kinetix 300 Drive Tag Numbers (continued)

ID	Data Type	Access	Description
75	DINT	R/W	Enable Accel/Decel function/limits for Velocity mode
76	REAL	R/W	Accel value for Velocity mode
77	REAL	R/W	Decel value for Velocity mode
78	DINT	R/W	Reset fault configuration
79	DINT	R/W	Master to system ratio (numerator)
80	DINT	R/W	Master to system ratio (denominator)
83	DINT	R	Extended status register
84	DINT	R/W	Hardware limit switches
85	DINT	R/W	Analog output function range: 0…8
86	REAL	R/W	Analog output scale for velocity quantities.
87	REAL	R/W	Analog output scale for current related quantities.
88	REAL	W	Analog output value.(Used if tag #85 is set to 0)
89	REAL	R/W	Analog input deadband. Applied when used as current or velocity reference.
90	REAL	R/W	Analog input offset. Applied when used as current/velocity reference
138	DINT	W	Turns on Profile Velocity for Internal Position Mode. Jogs motor in Position mode. Also set tags 176, and 177 for acceleration and deceleration and tag 180 for velocity
176	REAL	R/W	Accel value for position jog
177	REAL	R/W	Decel value for position jog
178	REAL	R/W	Decel value used for faults and aborts
179	DINT	R/W	Sets window for “In Position” Limits
180	REAL	R/W	Velocity reference for “Profiled” velocity
181	REAL	R/W	User units
182	DINT	R/W	A/B inputs reference counter value
183	REAL	R	Phase current
184	DINT	R/W	Target position in encoder pulses
185	DINT	R/W	Actual position in encoder pulses
186	DINT	R	Position error in encoder pulses
189	DINT	R/W	Input A1 de-bounce time in ms
190	DINT	R/W	Input A2 de-bounce time in ms
191	DINT	R/W	Input A3 de-bounce time in ms
192	DINT	R/W	Input A4 de-bounce time in ms
193	DINT	R/W	Input B1 de-bounce time in ms
194	DINT	R/W	Input B2 de-bounce time in ms
195	DINT	R/W	Input B3 de-bounce time in ms
196	DINT	R/W	Input B4 de-bounce time in ms

Kinetix 300 Drive Tag Numbers (continued)

ID	Data Type	Access	Description
197	DINT	R/W	Input C1 de-bounce time in ms
198	DINT	R/W	Input C2 de-bounce time in ms
199	DINT	R/W	Input C3 de-bounce time in ms
200	DINT	R/W	Input C4 de-bounce time in ms
201	DINT	R/W	Programmable Output function
202	DINT	R/W	Programmable Output Function
203	DINT	R/W	Programmable Output Function
204	DINT	R/W	Programmable Output Function
205	DINT	R	Current hall code
206	DINT	R	Primary encoder current value
207	DINT	R	Registration position
208	REAL	R	Registration position
209	REAL	R/W	Target position
210	REAL	R/W	Actual position
211	REAL	R	Position error
216	DINT	R/W	Positive Software limit switch value in Encoder counts
217	DINT	R/W	Negative Software limit switch value in Encoder counts
218	DINT	R/W	Soft limit switch action code
219	REAL	R/W	Positive Software limit switch value in User Units
220	REAL	R/W	Negative Software limit switch value in User Units
227	REAL	R/W	Homing Mode: ACCEL rate
228	REAL	R/W	Homing Mode: Home Position Offset
229	DINT	R/W	Homing Mode: Home Position Offset in encoder counts
230	REAL	R/W	Homing Mode: Fast Velocity
231	REAL	R/W	Homing Mode: Slow Velocity
232	DINT	R/W	Homing Mode: Homing Method
234	DINT	R/W	Homing Mode: Home Switch Input Assignment to a physical input.
249	DINT	R/W	Datalink “A” for input assembly
250	DINT	R/W	Datalink “B” for input assembly
251	DINT	R/W	Datalink “C” for input assembly
252	DINT	R/W	Datalink “D” for input assembly
253	DINT	R/W	Datalink “A” for output assembly
254	DINT	R/W	Datalink “B” for output assembly
255	DINT	R/W	Datalink “C” for output assembly
256	DINT	R/W	Datalink “D” for output assembly
264	DINT	R/W	TCP reply delay value

Kinetix 300 Drive Tag Numbers (continued)

ID	Data Type	Access	Description
266	DINT	R/W	Sets the mode of operation for the drive.
267	DINT	R/W	Enable Auto Start index function for Indexing mode when drive becomes enabled
268	DINT	R/W	Upon change from 0 to 1 the drive begins executing index
269	DINT	W	Value in this tag must change before time-out time is reached, otherwise the fault action is initiated.
270	DINT	R/W	Enable of the communication watchdog function
271	DINT	R/W	Time-out value in milliseconds between 10 and 1000
			Indexing section There are 11 tags per index. 32 Indexes total. **Index Base Address (B)** Index 0 272 Index 1 283 Index 2 294 Index 3 305 Index 4 316 Index 5 327 Index 6 338 Index 7 349 Index 8 360 Index 9 371 Index 10 382 Index 11 393 Index 12 404 Index 13 415 Index 14 426 Index 15 437 Index 16 448 Index 17 459 Index 18 470 Index 19 481 Index 20 492 Index 21 503 Index 22 514 Index 23 525 Index 24 536 Index 25 547 Index 26 558 Index 27 569 Index 28 580 Index 29 591 Index 30 602 Index 31 622
B+0	DINT	R/W	Index move type of absolute, incremental, registration or blended incremental for index 0 - 31
B+1	DINT	R/W	S-Curve or Trapezoidal move for index 0 - 31

Kinetix 300 Drive Tag Numbers (continued)

ID	Data Type	Access	Description
B+2	REAL	R/W	Maximum distance to move for index 0 - 31
B+3	REAL	R/W	Relative distance to move after registration event for registration types for index 0 - 31.
B+4	DINT	R/W	Number of types to repeat index before executing for index 0 - 31
B+5	DINT	R/W	Milliseconds to remain at current position before executing for index 0 - 31
B+6	REAL	R/W	Maximum velocity in UU while in motion for index 0 - 31
B+7	REAL	R/W	Maximum acceleration in UU while in motion for index 0 - 31
B+8	REAL	R/W	Maximum deceleration in UU while in motion for index 0 - 31
B+9	DINT	R/W	Next index to execute if action so indicates for index 0 - 31
B+10	DINT	R/W	Action to execute upon completing motion for index 0 - 31
624	DINT	R/W	Programmable input assignment
625	DINT	R/W	Programmable input assignment
626	DINT	R/W	Programmable input assignment
627	DINT	R/W	Programmable input assignment
628	DINT	R/W	Programmable input assignment
629	DINT	R/W	Programmable input assignment
630	DINT	R/W	Programmable input assignment
631	DINT	R/W	Programmable input assignment
632	DINT	W	Indexing starts from index specified
633	DINT	R	Aborts index in progress
634	DINT	R	Aborts homing in progress
637	DINT	R	Index currently executing
651	DINT	R/W	Motor Brake Release delay in ms
652	DINT	R/W	Motor Brake Engage delay in ms
653	DINT	RO	Fault E-code
654	DINT	WO	Reset ABS encoder error method

Using MicroLogix Explicit Messages with Kinetix 300 Drives

Introduction

You can use the MicroLogix CIP Generic (MSG) instruction, also know as explicit message, capability of the MicroLogix 1100 Series B and MicroLogix 1400 controllers to read and write to the Kinetix 300 drive tags using EtherNet/IP. For a list of Kinetix 300 drive tags see Appendix F.

There are three data types for these tags: DINT, REAL and string. The MicroLogix drive uses long file elements such as L12:0 for DINTs, floating point file elements such as F13:0 for Real and string file elements such as ST14:0 for strings.

The attribute value is used to designate the data format DINT, REAL or string and memory location volatile or nonvolatile as shown in the following table.

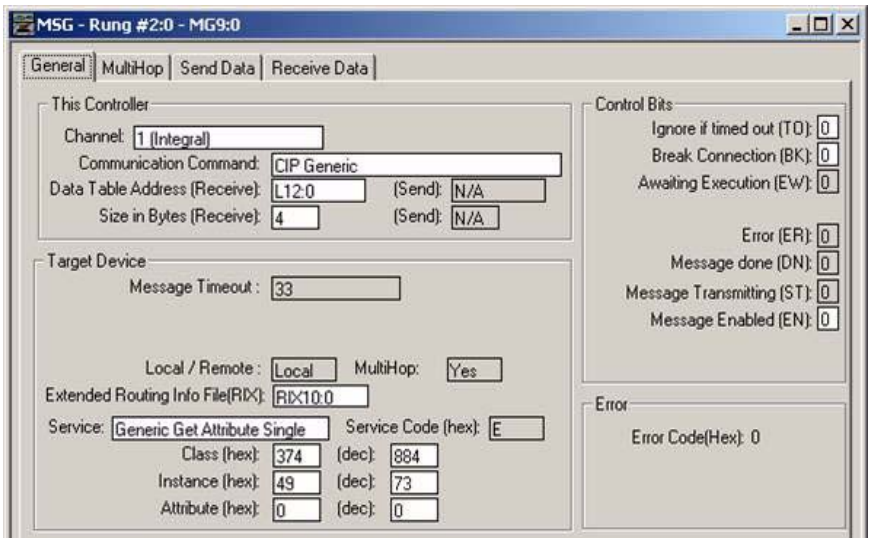
Attribute Value and Properties

Attribute	Format	Memory Stored In
0	DINT	Volatile
1	DINT	Nonvolatile
2	REAL	Volatile
3	REAL	Non-volatile
4	String	Volatile
5	String	Nonvolatile

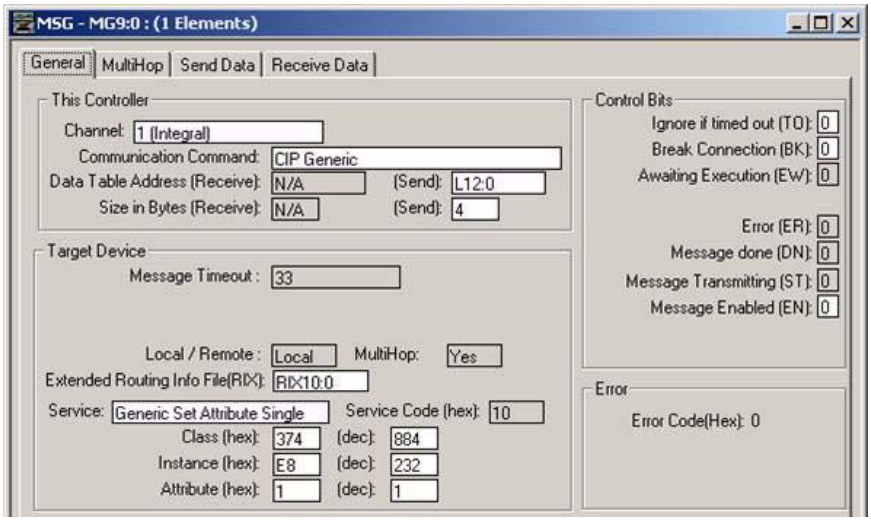
Explicit messaging allows DINTs to be read into and written from long file elements directly and Real to be read into and written from floating point file elements directly. Strings must be read into integer file elements, such as N11:0, by the MSG instruction and then copied into a string file element. Similarly strings must be copied into integer file elements first before being written by the MSG instruction. Examples of each of these are shown in the pages that follow.

IMPORTANT For each CIP Generic message (MSG) instruction, you must use both a unique message file element, for example MG9:0 and a unique extended routing information file element, for example RIX10:0. The routing information file element stores not only the path to the destination Kinetix 300 drive IP address, but also the specific Class/Instance/Attribute settings.

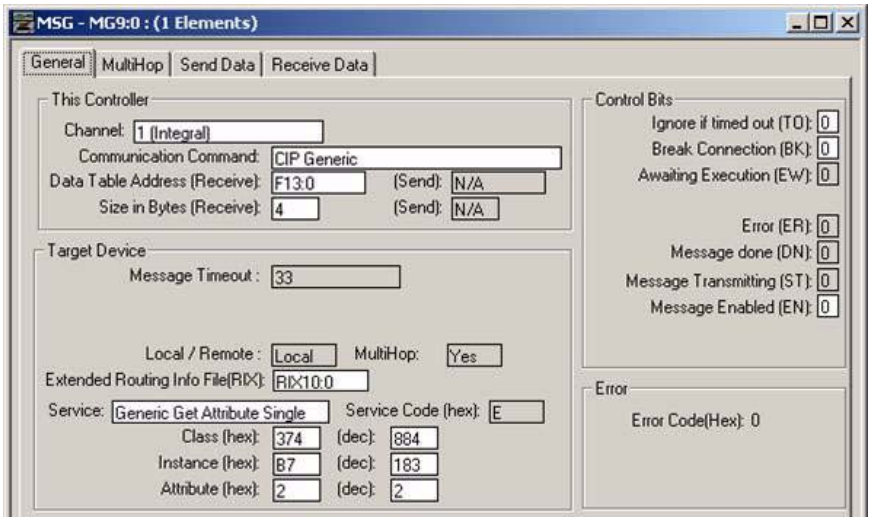
Reading a DINT from volatile memory (example ID 73 – bus voltage)



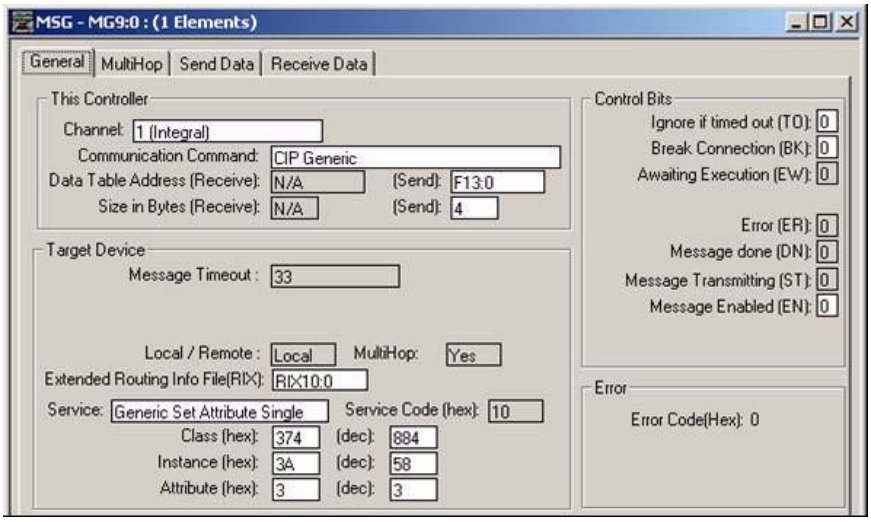
Writing a DINT into non-volatile memory (example ID 232 – homing method)



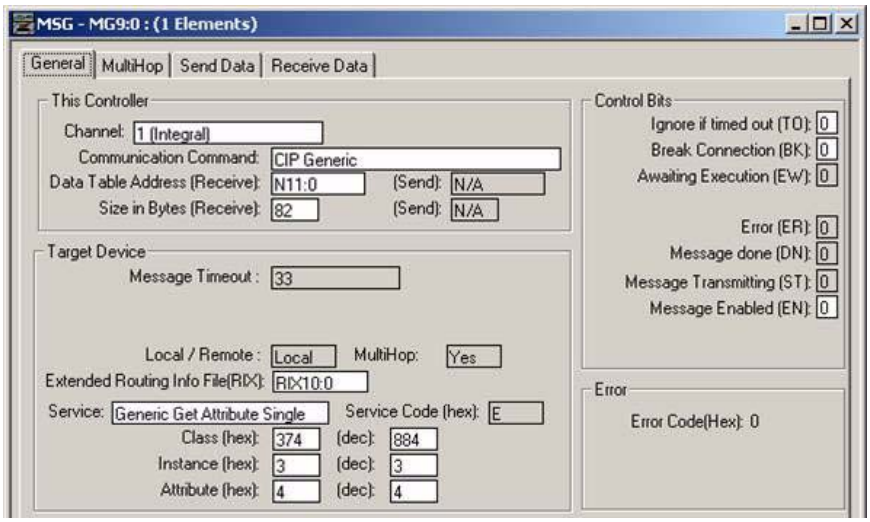
Reading a REAL from volatile memory (example ID 183 – phase current):

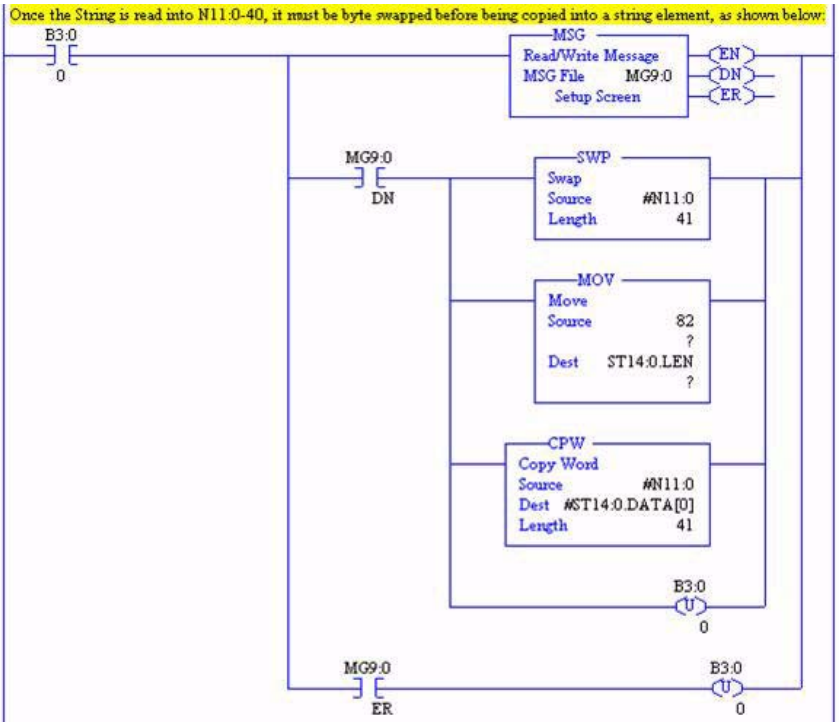


Writing a REAL into non-volatile memory (example ID 58 – zero speed window)

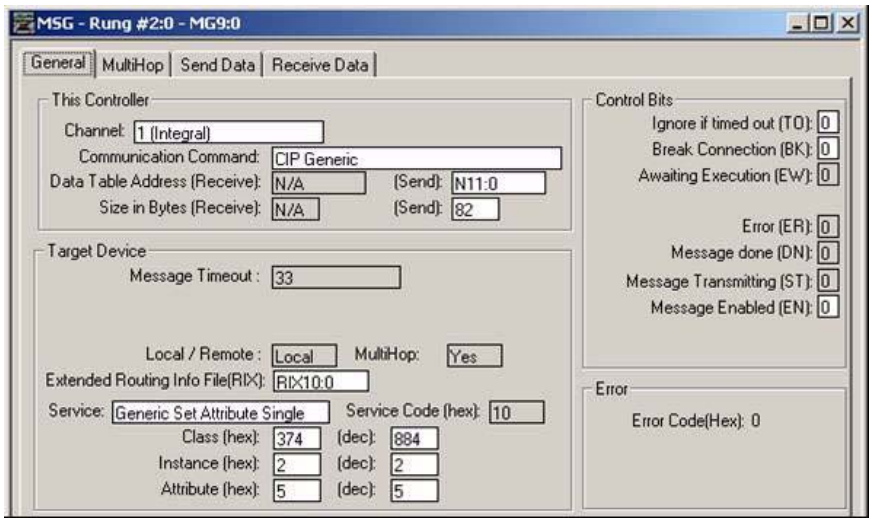


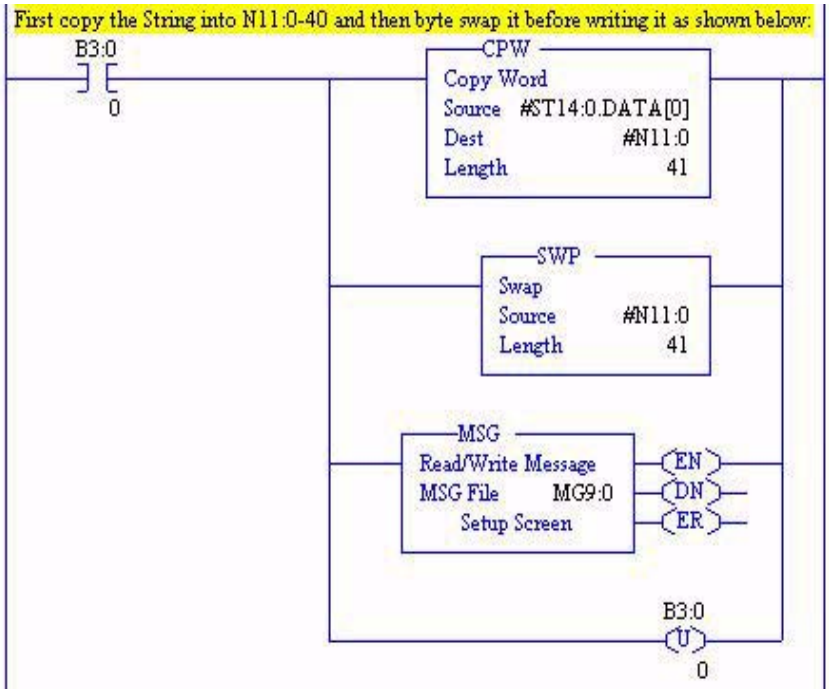
Reading a String from volatile memory (example ID 3 – drive's serial number)





Writing a String into non-volatile memory (example ID 2 – drive's symbolic name)





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